

5.0

RELEASES AND OTHER WASTE MANAGEMENT ACTIVITIES

5.1

On-Site Release and Transfers Off-Site for Waste Management Estimates

Release and other waste management estimates are the most highly scrutinized and publicized data in the TRI program. This section and section 5.2 discuss release estimates and other waste management activities made by facilities and by site surveyors. Major differences in these estimates between the facilities and the site surveyors are noted and, if possible, the reasons for the differences are explained. A discussion of the methodology used by the site surveyors to gather the data necessary to estimate these quantities is contained in Section 2. A discussion of the specific techniques used by the facilities and by the site surveyors when estimating releases and other waste management quantities is contained in Section 4.

Releases and transfers off-site for waste management estimates are reported by chemical and by the medium to which the chemical was released or transferred. When completing the Form R, facilities must assign on-site releases to one of the following five categories:

- Fugitive or non-point air emissions;
- Stack or point air emissions;
- Discharges to receiving streams or water bodies;
- Underground injections on site; or
- Releases to land on site.

Transfers to other off-site locations for other waste management practices are further subdivided into:

- Discharges to Publicly Owned Treatment Works (POTWs);
- Off-site transfer for disposal;
- Off-site transfer for treatment;
- Off-site transfer for recycling; and
- Off-site transfer for energy recovery.

This section also contains a discussion of releases and other waste management practices to each medium, how facility estimates compared to site surveyors estimates for that medium, and how estimates for reporting years 1994 and 1995 compared to estimates from reporting years 1987 and 1988.

When comparing the release and other waste management activity estimates of a facility to the estimate of a site surveyor, the percent difference between the two estimates is used. The percent difference between the facility estimate and the site surveyor estimate is calculated as follows:

$$\text{Percent Difference} = (\text{Fa} - \text{SS})/\text{SS} \times 100$$

where: Fa = Facility Estimate

SS = Site Surveyor Estimate

5.1.1 Overview of On-Site Releases and Transfers Off-Site for Waste Management as Reported by Facilities and by Site Surveyors

On-site releases and transfers off-site for waste management quantities as reported by the facilities and the site surveyors were summed for all chemicals to get total facility estimates. Total facility estimates were scaled and summed for all facilities to get total releases and other waste management quantities for each SIC Code. The total quantity for each SIC Code are presented by medium in Tables 5-1, 5-3, 5-5, 5-7, 5-9, and 5-11. Facility estimates were lower than site surveyor estimates in all SIC Codes for fugitive air releases, transfers to off-site recycling, and transfers to off-site energy recovery. In general, facility estimates were higher than site surveyor estimates in each SIC Code for stack air releases. For all SIC Codes surveyed for reporting year (RY) 1994, total quantities for the SIC Code as estimated by the facility are lower than total quantities for the SIC Code as estimated by the site surveyor. Total on-site releases and transfers off-site for waste management for SIC Codes 26 and 286, surveyed for RY 1995, as estimated by the facility are within 2% of the total quantities estimated by the site surveyor.

Table 5-1 is a summary of SIC Code 25 TRI on-site releases and transfers off-site for waste management quantities for the RY 1994. The greatest percent difference in estimates by facility and by site surveyor are for off-site transfers to treatment, where facility estimates were 250% greater than site surveyor estimates. The overall impact of this difference in off-site treatment is not significant, as transfer to off-site treatment makes up only a small portion of the total quantity. None of the facilities surveyed in SIC Code 25 had releases to receiving streams, performed underground injection, or had releases to land on site. Total on-site releases and transfers off-site for waste management estimated by facilities and site surveyors were in close agreement.

Table 5-1

Summary of SIC Code 25 TRI On-Site Releases and Transfers Off-Site for Waste Management for Reporting Year 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	3.72	4.54	-18%
Stack Air	37.9	36.9	2.8%
Receiving Stream	0.00	0.00	NA
Underground Injection	0.00	0.00	NA
Land On Site	0.00	0.00	NA
POTW	0.647	0.783	-17%
Off-Site Disposal	0.00	0.437	-100%
Off-Site Treatment	1.13	0.319	250%
Off-Site Recycling	0.733	1.20	-39%
Off-Site Energy Recovery	9.12	10.6	-14%
Total	53.3	54.8	-2.8%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-2 presents two forms of the 1994 on-site releases and transfers off-site for waste management for SIC Code 25. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total releases and transfers off-site for waste management for SIC Code 25 for those facilities with less than 16 Form Rs. Thus, each facility surveyed represents a group of facilities in the TRIS database to determine the scaled-up total. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 25 as reported by SIC Code 25 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 25 release profile. (Site surveyors estimates are not presented on this table). As discussed in Section 2, facility site selection excluded facilities that reported more than 15 chemicals. Most facilities that manufacture, process, or otherwise use more than 15 chemicals would have larger quantities than the average facility. The percent difference in total on-site releases and transfers off-site for waste management quantities between the scaled-up estimate and the TRI database totals is -17%.

Table 5-2

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 25 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	41.6	51.5	-19%
Receiving Stream	0.00	0.000266	-100%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.00	0.0637	-100%
POTW	0.647	0.145	346%
Off-Site Transfers	11	12.6	-13%
Total	53.3	64.3	-17%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-3 is a summary of SIC Code 281 TRI on-site releases and transfers off-site for waste management for RY 1994. In SIC Code 281, the most significant difference between facility estimates and site surveyor estimates is in underground injection. This difference is attributed to errors made by two facilities surveyed. These two facilities perform manufacturing process operations that are not typical in chemical manufacturing facilities. If these two facilities are not considered in the sum of on-site releases and transfers off-site for waste management, the total percent difference for total on-site releases and transfers off-site for waste management quantities in SIC Code 281 releases drops to -1.1 percent.

Table 5-3

Summary of SIC Code 281 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	15.4	16.1	-4.3%
Stack Air	126	126	0.53%
Receiving Stream	1.73	1.65	5.1%
Underground Injection	15.0	38.0	-61%
Land On Site	0.00440	0.00440	0.0%
POTW	0.0644	0.0641	0.47%
Off-Site Disposal	29.9	30.0	-0.17%
Off-Site Treatment	9.97	10.1	-1.5%
Off-Site Recycling	1.18	1.48	-21%
Off-Site Energy Recovery	0.304	2.00	-85%
Total	200	225	-11%

*Percent Difference = $(Fa-SS)/SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
 NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-4 presents two forms of the 1994 on-site releases and transfers off-site for waste management for SIC Code 281. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management quantities for SIC Code 281 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 281 as reported by all SIC Code 281 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 281 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management quantities between the scaled-up estimate and the TRI database totals is -51%.

Table 5-4

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 281 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	141	90.8	36%
Receiving Stream	1.73	25.4	-94%
Underground Injection	15.0	153	-90%
Land On Site	0.004	68.2	-100%
POTW	0.064	31.4	-100%
Off-Site Transfers	41.1	41.1	0.7%
Total	200	410	-51%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-5 is a summary of SIC Code 285 TRI on-site releases and transfers off-site for waste management for the reporting year 1994. The most significant difference in on-site releases and transfers off-site for waste management activity estimates by facility and by site surveyor are for transfers to off-site recycling. None of the facilities surveyed in SIC Code 285 had releases to receiving streams, underground injection, or to land on site. One of the surveyed facilities in this SIC Code put release values under the wrong release type and grossly underestimated all on-site releases and transfers off-site for waste management. If this facility is not considered in the total sum, the total percent difference between facility estimates and site surveyor estimates in SIC Code 285 drops to -20%.

Table 5-5

Summary of SIC Code 285 TRI On-Site Releases and Transfer Off-Site for Waste Management for RY 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	2.23	3.15	-29%
Stack Air	0.654	0.533	23%
Receiving Stream	0.00	0.00	NA
Underground Injection	0.00	0.00	NA
Land On Site	0.00	0.00	NA
POTW	0.0615	0.0157	290%
Off-Site Disposal	0.0874	0.219	-60%
Off-Site Treatment	0.101	0.462	-78%
Off-Site Recycling	2.75	5.08	-46%
Off-Site Energy Recovery	2.67	2.87	-7.0%
Total	8.55	12.3	-31%

*Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-6 presents two forms of the 1994 on-site releases and transfers off-site for waste management for SIC Code 285. In the second column, on-site releases and transfers off-site for waste management quantities as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management quantities for SIC Code 285 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 285 as reported by all SIC Code 285 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 285 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management releases and other waste management quantities between the scaled-up estimate and the TRI database totals is -92%.

Table 5-6

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 285 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	2.88	13.5	-79%
Receiving Stream	0.00	0.00	0.0%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.00	0.055	-100%
POTW	0.0615	1.63	-96%
Off-Site Transfers	5.61	95.5	-94%
Total	8.55	111	-92%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-7 is a summary of SIC Code 30 TRI on-site releases and transfers off-site for waste management quantities for the reporting year 1994. Many facilities in this SIC Code reported fugitive emissions as stack emissions. Even so, the sum of the fugitive and stack emissions estimated by the facilities and site surveyors was in close agreement. The greatest percent difference in estimates by facility and by site surveyor are for discharges to POTWs, where facility estimates were 100% less than site surveyor estimates. However, discharges to POTWs account for much less than 0.1 percent of all quantities. None of the facilities surveyed in SIC Code 30 had on-site releases to receiving streams, underground injection, or to land on site. Total on-site releases and transfers off-site for waste management quantities estimated by facilities and site surveyors were in close agreement.

Table 5-7

Summary of SIC Code 30 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1994 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	26.0	69.3	-63%
Stack Air	182	138	31%
Receiving Stream	0.00	0.00	NA
Underground Injection	0.00	0.00	NA
Land On Site	0.00	0.00	NA
POTW	0.00	0.00145	-100%
Off-Site Disposal	7.13	5.84	22%
Off-Site Treatment	21.6	23.5	-8.1%
Off-Site Recycling	10.9	17.2	-37%
Off-Site Energy Recovery	0.332	0.347	-4.3%
Total	248	254	-2.4%

*Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
 NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-8 presents two forms of the 1994 on-site releases and transfers off-site for waste management quantities for SIC Code 30. In the second column, on-site releases and transfers off-site for waste management quantities as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management quantities for SIC Code 30 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 30 as reported by all SIC Code 30 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC 30 release profile. The percent difference in total on-site releases and transfers off-site for waste management quantities between the scaled-up estimate and the TRI database totals is 7.4%.

Table 5-8

1994 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 30 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	208	154	35%
Receiving Stream	0.00	0.230	-100%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.00	0.357	-100%
POTW	0.00	2.22	-100%
Off-Site Transfers	40.0	73.7	-46%
Total	248	231	7.4%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-9 is a summary of SIC Code 26 TRI on-site releases and transfers off-site for waste management for RY 1995. None of the facilities surveyed in SIC Code 26 had releases to underground injection, off-site treatment, off-site recycling, or off-site energy recovery. Facility and site surveyor estimates are in close agreement. The close agreement between the facility and surveyor estimates in SIC Code 26 can be attributed to the step-by-step procedures listed in the NCASI Handbook of Chemical Specific Information for SARA 313 Form R Reporting which most paper and paperboard facilities use as guidance for filling out Form Rs. This manual is distributed by NCASI, and has not been through EPA approval. However, it is still a good source for documentation and calculations needed to complete the Form Rs.

Table 5-9

Summary of SIC Code 26 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1995 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	12.6	12.9	-2.5%
Stack Air	69.9	69.1	1.2%
Receiving Stream	2.03	1.85	9.6%
Underground Injection	0	0	NA
Land On Site	0.189	0.119	59%
POTW	0.00421	0.00421	0.0%
Off-Site Disposal	0.761	0.767	-0.74%
Off-Site Treatment	0	0	NA
Off-Site Recycling	0	0	NA
Off-Site Energy Recovery	0	0	NA
Total	85	85	0.8%

*Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
 NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-10 presents two forms of the 1995 on-site releases and transfers off-site for waste management for SIC Code 26. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management for SIC Code 26 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 26 as reported by SIC Code 26 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 26 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management between the scaled-up estimate and the TRI database totals is -66%.

Table 5-10

1995 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 26 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	82.5	166	-50%
Receiving Stream	2.03	7.01	-71%
Underground Injection	0.00	0.00	0.0%
Land On Site	0.189	3.39	-94%
POTW	0.00421	41.0	-100%
Off-Site Transfers	0.761	29.9	-97%
Total	85	247	-66%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

Table 5-11 is a summary of SIC Code 286 TRI on-site releases and transfers off-site for waste management quantities for the reporting year 1995. None of the facilities surveyed in SIC Code 286 had on-site releases to underground injection. The close agreement between the facility and surveyor estimates SIC Code 286 can be attributed to the relatively large environmental staff and explicit corporate policies followed by the large organic chemical companies visited.

Table 5-11

Summary of SIC Code 286 TRI On-Site Releases and Transfers Off-Site for Waste Management for RY 1995 (millions of lbs.)

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	7.80	9.15	-15%
Stack Air	18.0	16.7	7.6%
Receiving Stream	0.0958	0.123	-22%
Underground Injection	0	0	NA
Land On Site	0.000136	0.000180	-24%
POTW	125	128	-2.2%
Off-Site Disposal	0.0910	0.100	-9.3%
Off-Site Treatment	36.4	36.4	-0.04%
Off-Site Recycling	5.11	5.11	0.0%
Off-Site Energy Recovery	127	129	-1.4%
Total	320	325	-1.5%

*Percent Difference = $(Fa-SS)/SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Table 5-12 presents two forms of the 1995 on-site releases and transfers off-site for waste management for SIC Code 286. In the second column, on-site releases and transfers off-site for waste management as reported by the facilities surveyed were scaled-up to represent the total on-site releases and transfers off-site for waste management for SIC Code 286 for those facilities with less than 16 Form Rs. The third column is the total on-site releases and transfers off-site for waste management amount for SIC Code 286 as reported by SIC Code 286 facilities with less than 16 Form Rs taken from the TRIS database. This comparison examines how closely the surveyed facilities match the overall SIC Code 286 release profile. (Site surveyors estimates are not presented on this table). The percent difference in total on-site releases and transfers off-site for waste management between the scaled-up estimate and the TRI database totals is 8.0%.

Table 5-12

1995 Reported TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Code 286 (millions of lbs.)

Medium	Scaled Quantity of Chemicals as Reported by the Facilities Surveyed	Quantity of Chemicals as Reported by All Facilities in the TRIS Database	Percent Difference*
Fugitive and Stack Air	25.8	77.9	-67%
Receiving Stream	0.0958	4.07	-98%
Underground Injection	0.00	33.1	-100%
Land On Site	0.00	0.926	-100%
POTW	125	68.8	82%
Off-Site Transfers	169	163	3.7%
Total	320	348	-8.0%

*Percent Difference = (Sca - TRI)/TRI x 100, where Sca = Scaled Facility Estimate Total and TRI = Facility Estimate Total as Reported to TRI.

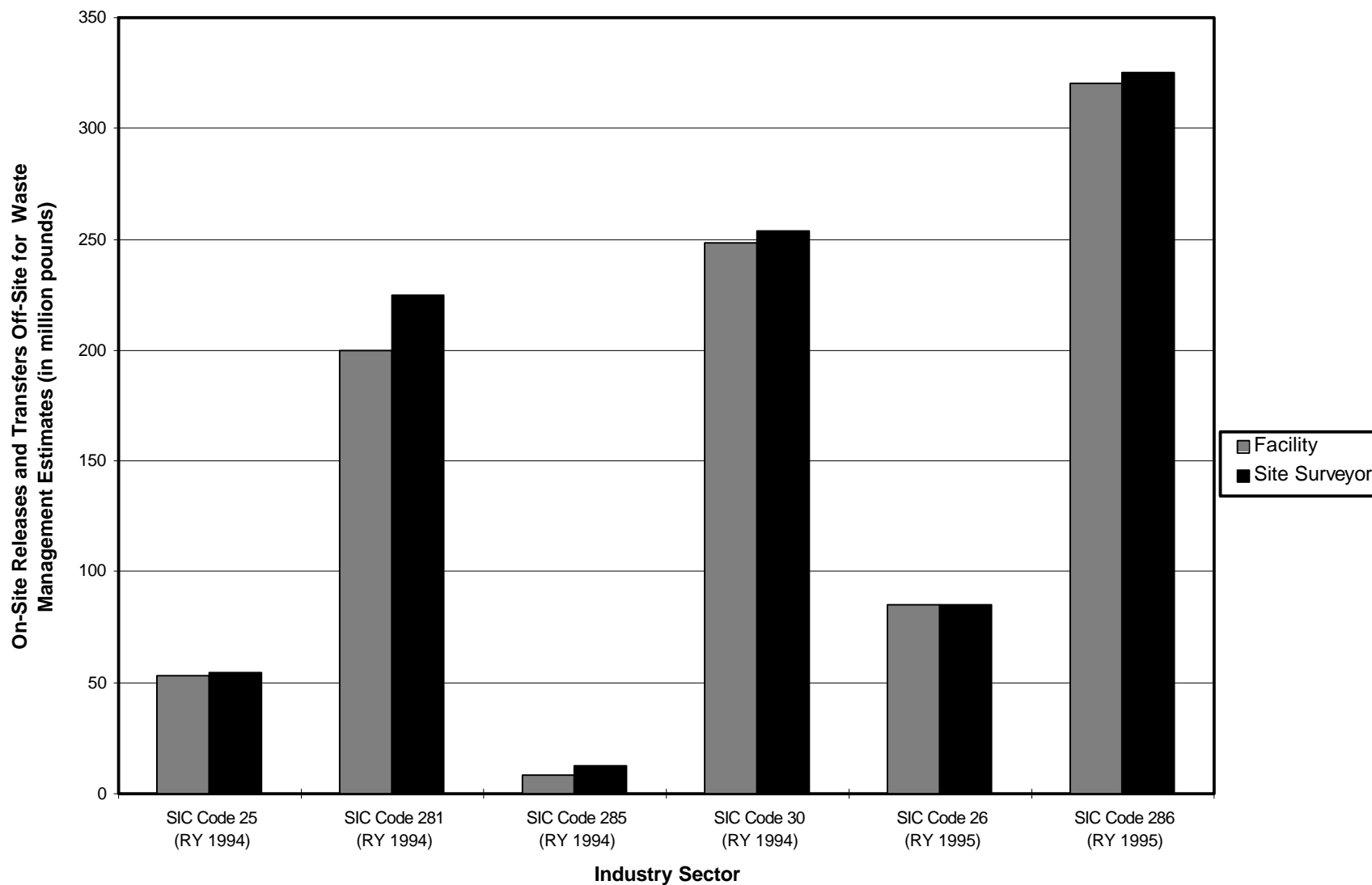
Figure 5-1 presents estimates of total on-site releases and transfers off-site for waste management calculated by facilities and site surveyors for each SIC Code surveyed for RY 1994 and RY 1995. The total on-site releases and transfers off-site for waste management were in good agreement, calculated to be within +3% for most SIC Codes. Estimates of total on-site releases and transfers off-site for waste management calculated by facilities and site surveyors for all SIC Codes surveyed in RY 1994 and RY 1995 differed by 4%.

Figures 5-2, 5-3, and 5-4 present the relative percent differences in estimates of on-site releases and transfers off-site for waste management between facilities and site surveyors for each SIC Code. In all SIC Codes, fugitive emissions tend to be incorrectly reported as stack emissions, leading to overestimates of stack emissions and underestimates of fugitive emissions. Another trend in SIC Codes 25, 281, 285, and 30 for RY 1994 is the misreporting of chemical transfers off-site for purposes of disposal, treatment, recycling, or energy recovery. Many facilities do not record the actual fate of chemicals transferred off-site when filling out the Form Rs. Most facilities check the off-site disposal or off-site treatment boxes without considering the possibility of recycling or energy recovery. Facilities in these same SIC Codes tend to have container residue that was overlooked. The container residue is usually treated, recycled, or disposed of by the vendor collecting the drums, and not incorporated into the product as reported by the facilities.

5.1.2 Comparison of RY 1994 and RY 1995 On-Site Releases and Transfers Off-Site for Waste Management to RY 1987 and RY 1988 On-Site Releases and Transfers Off-Site for Waste Management

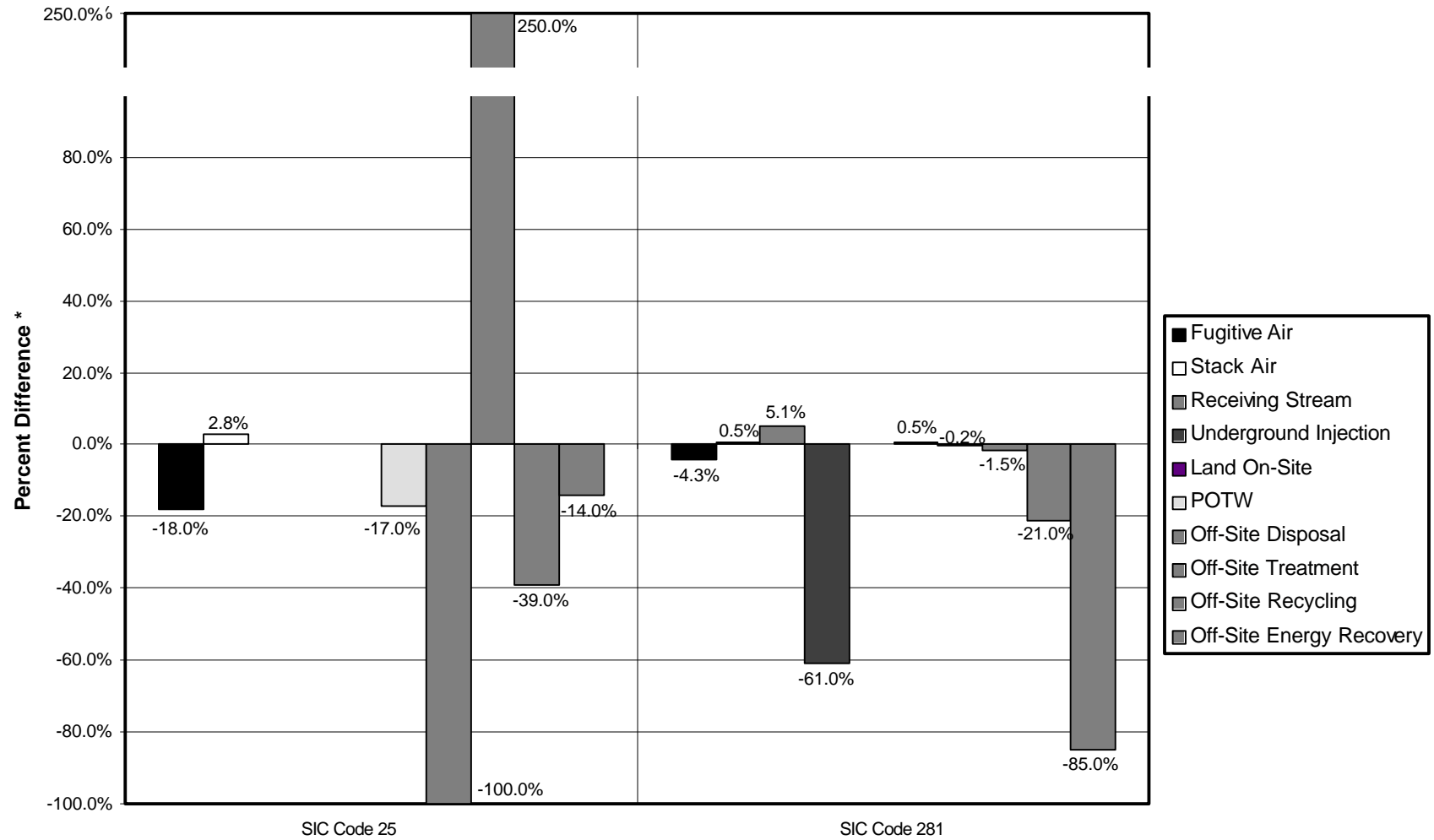
Tables 5-13 through 5-16 contain the TRI on-site releases and transfers off-site for waste management for the surveys conducted for RY 1995, 1994, 1988, and 1987 data, respectively. Different SIC Codes were surveyed in each reporting year of the site survey program, so caution should be exercised when comparing data from one reporting year to the next. The tables present a comparison between the quantity of chemicals released on-site or transferred off-site for waste management as reported by the facilities and the quantity of chemicals released on-site or transferred off-site for waste management as reported by the site surveyor. The percent difference between the estimates are also provided. The percent differences for each reporting year are summarized on Figures 5-5 and 5-6.

Figure 5-1. Comparison of Facility and Site Surveyor Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management



Data for this figure can be found on Tables 5-1 through 5-12.

Figure 5-2. Comparison of Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management in SIC Codes 25 and 281 Surveyed for Reporting Year 1994

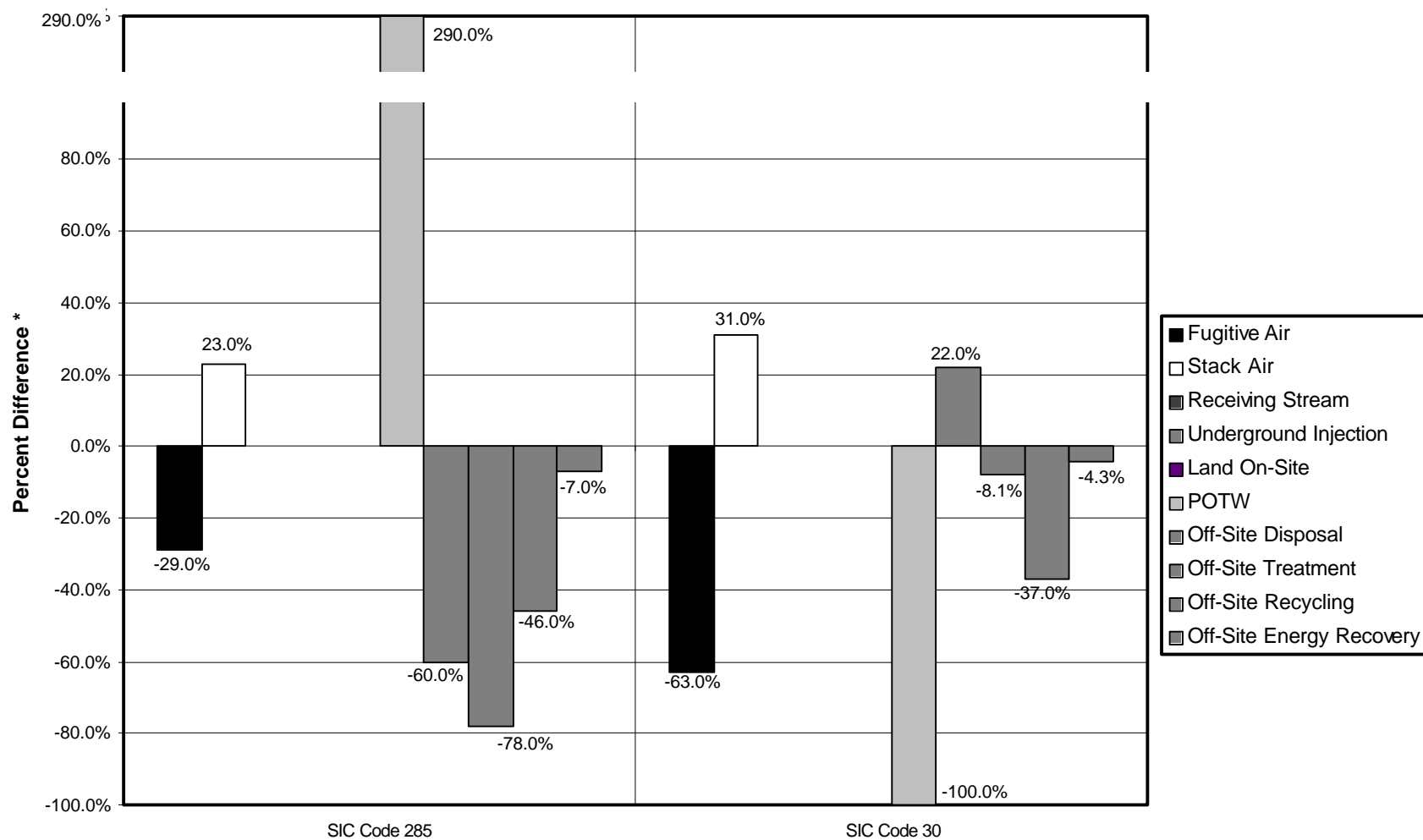


* Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-1 and 5-3.

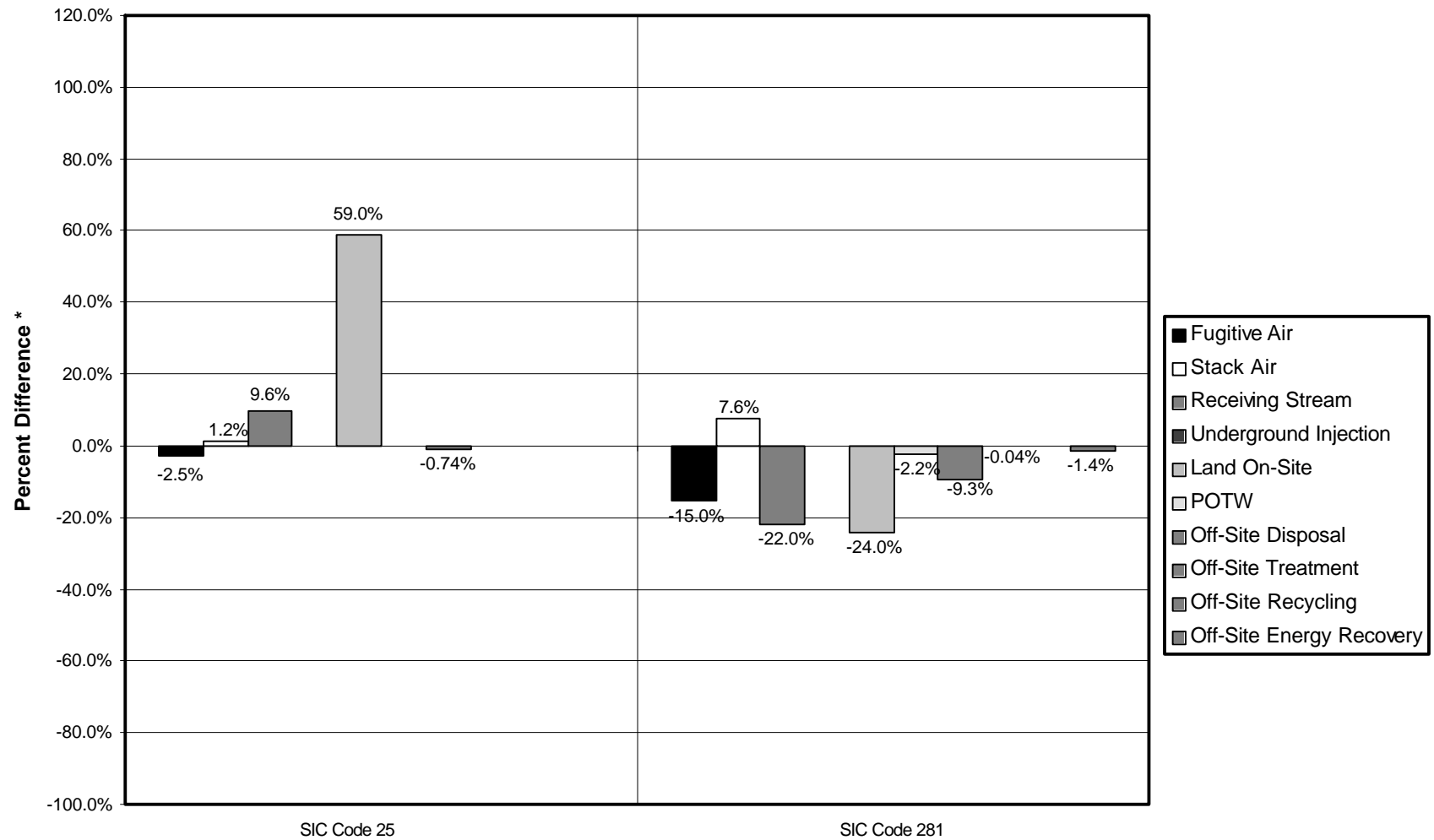
Figure 5-3. Comparison of Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management in SIC Codes 285 and 30 Surveyed for Reporting Year 1994



* Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
 NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-5 and 5-6.

Figure 5-4. Comparison of Estimates of Total On-Site Releases and Transfers Off-Site for Waste Management in SIC Codes 26 and 286 Surveyed for Reporting Year 1995



* Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
 NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-9 and 5-11.

Table 5-13**Summary of RY 1995 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 26 and 286 (millions of lbs.)**

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	20	22	-7.6%
Stack Air	88	86	2.4%
Receiving Stream	2.1	2.0	7.7%
Underground Injection	NA	NA	NA
Land On Site	0.19	0.12	59%
POTW	125	128	-2.2%
Off-Site Transfers	169	171	-1.2%
Total	405	410	-1.2%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 5-14**Summary of RY 1994 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 25, 281, 285, and 30 (millions of lbs.)**

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	47	93	-49%
Stack Air	350	300	15%
Receiving Stream	1.7	1.7	5.1%
Underground Injection	15	38	-61%
Land On Site	0.0044	0.0044	0.0%
POTW	0.77	0.86	-11%
Off-Site Transfers	98	110	-13%
Total	510	550	-6.7%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 5-15**Summary of RY 1988 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 28, 291, and 34 Through 38 (millions of lbs.)**

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	470	480	-2.1%
Stack Air	850	740	15%
Receiving Stream	30	3	900%
Underground Injection	0.00	0.00	NA
Land On Site	60	70	-14%
POTW	550	750	-27%
Off-Site Transfers	530	420	26%
Total	2,490	2,463	1.1%

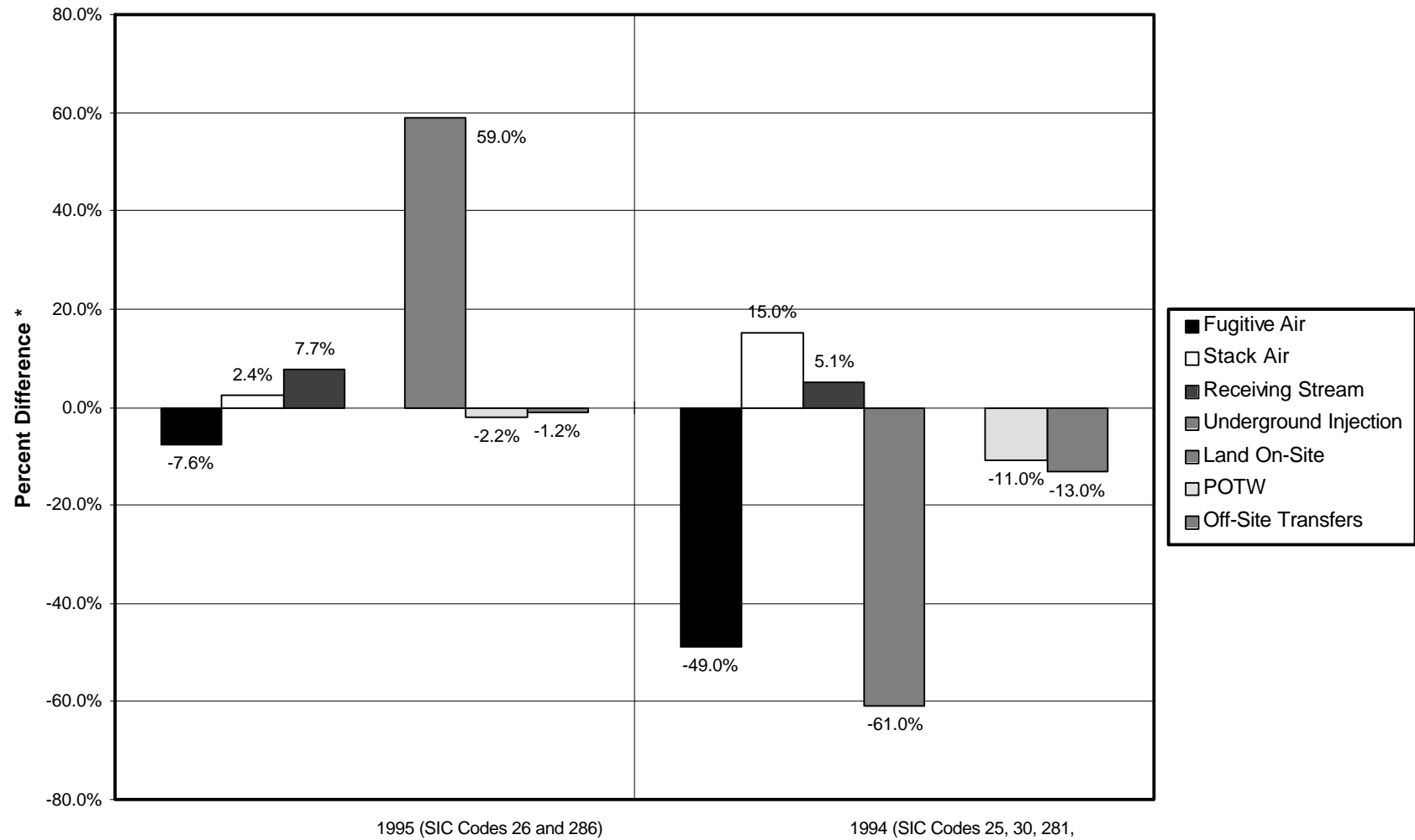
*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

Table 5-16**Summary of RY 1987 TRI On-Site Releases and Transfers Off-Site for Waste Management for SIC Codes 20 Through 39 (millions of lbs.)**

Medium	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Fugitive Air	800	800	0.0%
Stack Air	1,800	1,900	-5.3%
Receiving Stream	9,600	9,900	-3.0%
Underground Injection	3,200	3,200	0.0%
Land On Site	2,400	2,700	-11%
POTW	2,200	2,000	10%
Off-Site Transfers	2,600	2,700	3.7%
Total	22,500	23,000	-2.2%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

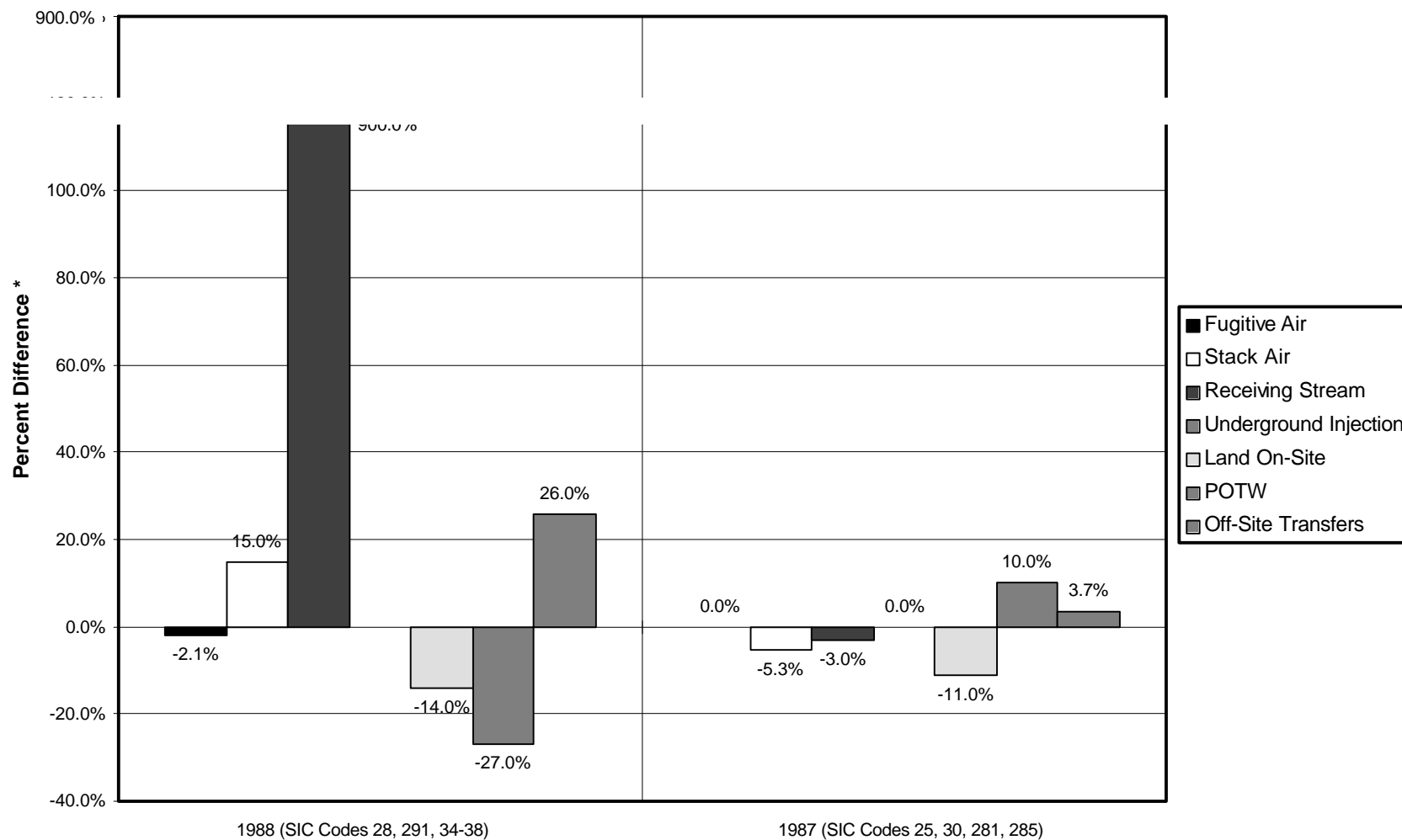
Figure 5-5. Comparison of On-Site Releases and Transfers Off-Site for Waste Management from Reporting Years 1995 and 1994



* Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.
 NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-13 and 5-14.

Figure 5-6. Comparison of On-Site Releases and Transfers Off-Site for Waste Management from Reporting Years 1988 and 1987



* Percent Difference = $(Fa - SS) / SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no releases to this medium at the facilities surveyed in this SIC Code.

Data for this figure can be found on Tables 5-11 and 5-12.

The percent differences in facility and site surveyor total estimates for RY 1987, RY 1988, RY 1994, and RY 1995 are presented in Table 5-17. The percent differences for each reporting year were less than 7 percent.

Table 5-17

**Percent Difference of Facility Estimated and Site Surveyor
Estimated Total TRI On-Site Releases and Transfers Off-Site for Waste
Management for RY 1995, RY 1994, RY 1988, and RY 1987 (millions of lbs.)**

TRI Reporting Year	Percent Difference*
1995	-1.2%
1994	-6.7%
1988	1.1%
1987	-2.2%

*Percent Difference = $(Fa-SS)/SS \times 100$, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

5.1.3 Analysis of Specific Releases

Analyses of specific on-site releases and transfers off-site for waste management are presented in this section. These analyses only apply to facilities that correctly reported chemical on-site releases and transfers off-site for waste management. Facilities that incorrectly reported an on-site release or transfer off-site for waste management, incorrectly did not report an on-site release or transfer off-site for waste management, or correctly did not report an on-site release or transfer off-site for waste management are not included in the analyses in section 5.1.3. On-site releases and transfers off-site for waste management in this section are analyzed on a total facility basis. For example, if a facility underestimated the release of a chemical by 1,000, but overestimated the release of another chemical by 1,000 lbs, the errors would cancel and would not be identified in this analysis.

5.1.3.1 Fugitive Air Releases

A comparison of the percent difference between facility estimates and site surveyor estimates for fugitive air releases is presented in Table 5-18. It is notable that in SIC Code 30, over half the facilities estimates differed by more than 50 percent from the site surveyor estimate.

Table 5-18

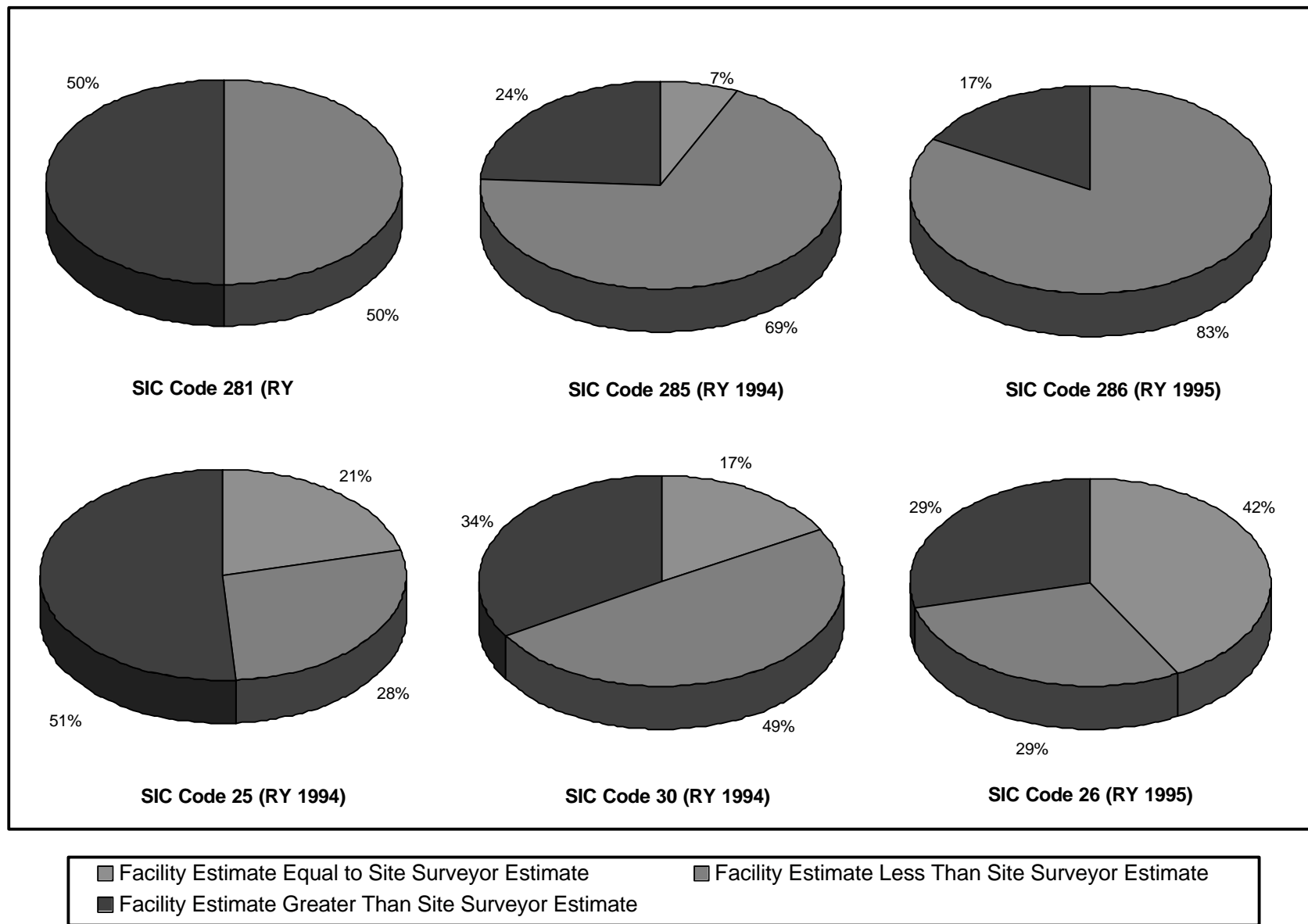
Comparison of the Percent Difference (PD)¹ Between Facility and Site Surveyor Estimates for Fugitive Air Emissions

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	21%	39%	47%	79%	21%
281 (RY 1994)	0%	13%	38%	67%	33%
285 (RY 1994)	7%	7%	12%	69%	31%
30 (RY 1994)	17%	17%	28%	40%	60%
26 (RY 1995)	43%	43%	43%	57%	43%
286 (RY 1995)	0%	0%	50%	83%	17%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Release Estimate, and SS = Site Surveyor Release Estimate.
Percentages are based on survey weighted data.

In Figure 5-7, the facility fugitive air emissions estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

**Figure 5-7. Comparison of Facility Estimates and Site Surveyor Estimates
for Fugitive Air Emissions**



5.1.3.2 Stack Air Releases

A comparison of the percent difference between facility estimates and site surveyor estimates for stack air releases is presented in Table 5-19. It is notable that in SIC Code 285, over half the facilities' estimated releases differed by more than 50 percent from the site surveyor estimate.

Table 5-19

Comparison of the Percent Difference (PD)¹ Between Facility and Site Surveyor Estimates for Stack Air Emissions

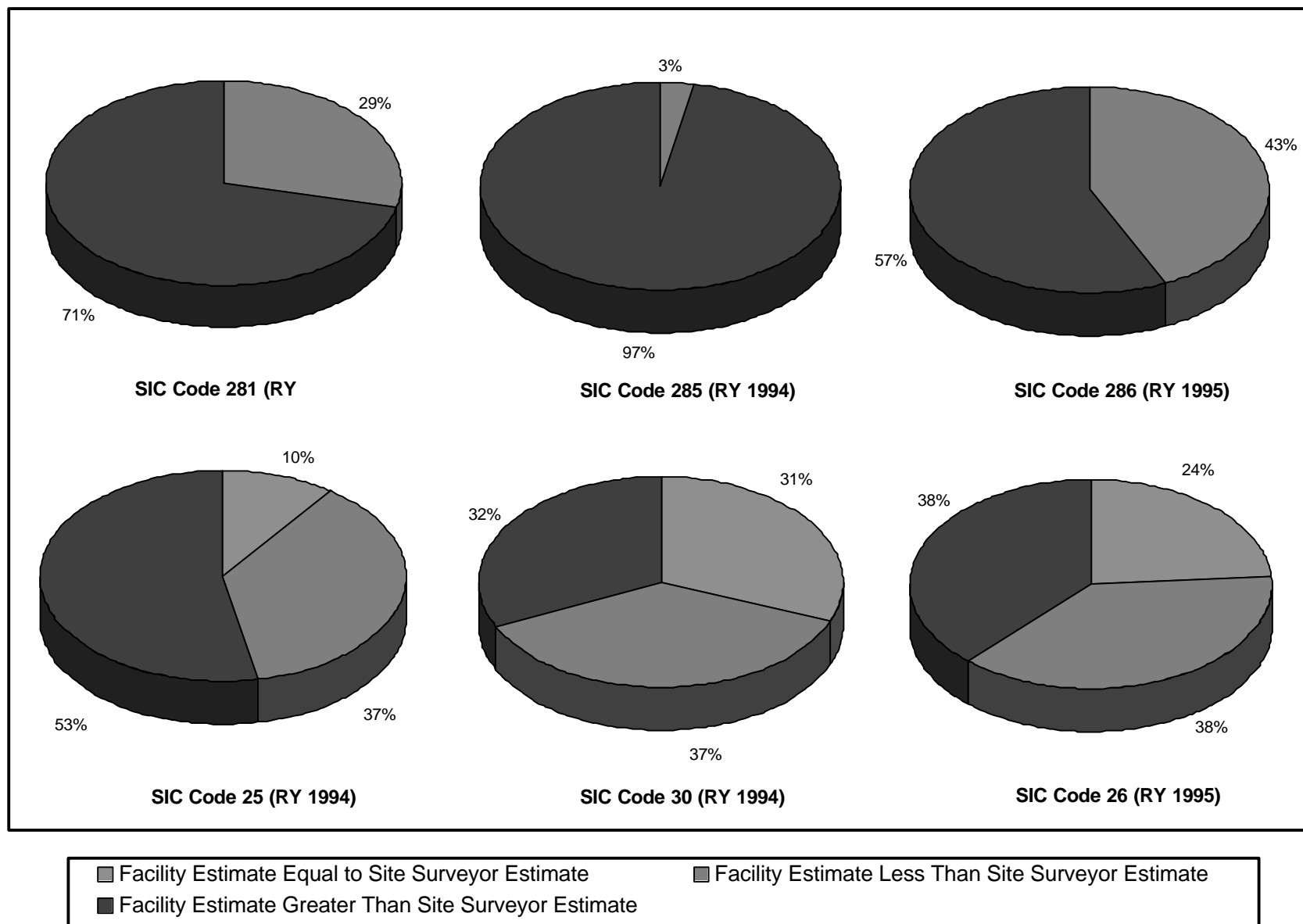
SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	10%	25%	55%	97%	3%
281 (RY 1994)	0%	22%	78%	92%	8%
285 (RY 1994)	0%	28%	28%	37%	63%
30 (RY 1994)	31%	35%	58%	75%	25%
26 (RY 1995)	38%	50%	75%	75%	25%
286 (RY 1995)	0%	14%	14%	57%	43%

¹PD = The absolute value of the percent difference, where percent difference = $(Fa - SS)/SS \times 100$, Fa = Facility Release Estimate, and SS = Site Surveyor Release Estimate.

In Figure 5-8, the facility stack air emissions estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

In SIC Codes 25, 281, 285, and 286, facility estimates were higher than site surveyors estimates more often than they were equal to or lower than site surveyor estimates. In SIC Codes 26 and 30, facility estimates were equal to, greater than, and less than site surveyor estimates in approximately equal proportions. Site surveyors often encountered facilities that did

**Figure 5-8. Comparison of Facility Estimates and Site Surveyor Estimates
for Stack Air Emissions**



not understand the definition of stack air releases and misclassified fugitive emissions as stack emissions. This appears to be the primary reason most of the SIC Codes surveyed showed an inclination to overestimate stack releases.

5.1.3.3 Discharges to Receiving Streams

A comparison of the percent difference between facility estimates and site surveyor estimates for receiving stream discharges is presented in Table 5-20. SIC Codes 25, 285, and 30 did not have any surveyed facilities with discharges to receiving streams. SIC Code 285 had two facilities which reported discharges to receiving streams. One facility overestimated emissions by 90 percent, and the other facility underestimated emissions by 55 percent.

Table 5-20

Comparison of the Percent Difference (PD)¹ Between Facility and Site Surveyor Estimates for Discharges to Receiving Streams

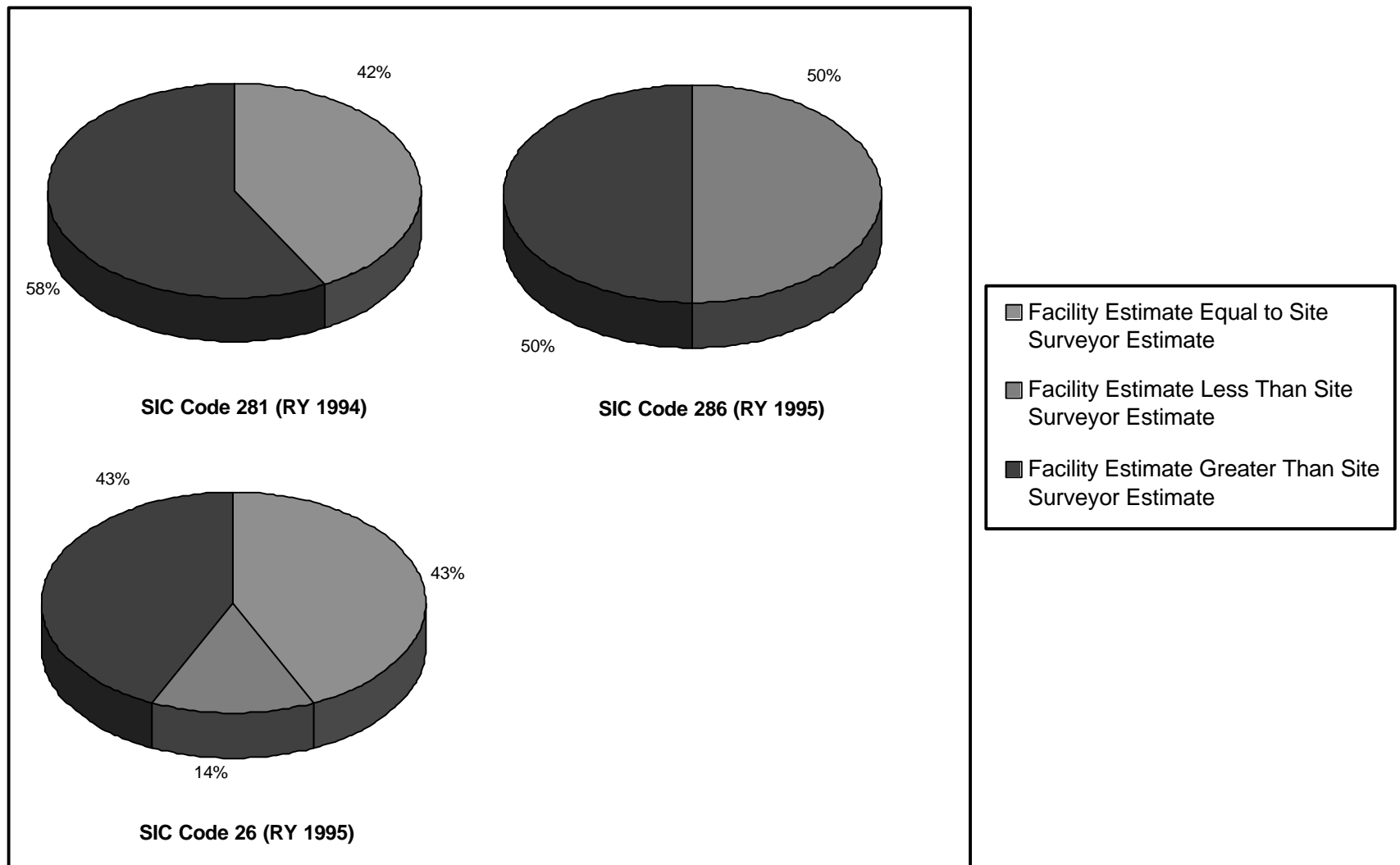
SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	42%	73%	87%	87%	13%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	43%	43%	72%	86%	14%
286 (RY 1995)	0%	0%	0%	0%	100%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Release Estimate, and SS = Site Surveyor Release Estimate.

NA - Not applicable. There were no releases to receiving streams at the facilities surveyed for this SIC Code.

In Figure 5-9, the facility receiving stream release estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether

**Figure 5-9. Comparison of Facility Estimates and Site Surveyor Estimates
for Receiving Streams**



the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.4 Underground Injection

A comparison of the percent difference between facility estimates and site surveyor estimates for underground injection quantities is presented in Table 5-21.

Only two facilities surveyed in SIC Code 281 had releases by underground injection. The facility estimates for these quantities is between 10% and 50% less than the site surveyor estimates. No facilities surveyed in SIC Codes 25, 26, 30, 285, or 286 had underground injection releases.

Table 5-21

Comparison of the Percent Difference (PD)¹ Between Facility and Site Surveyor Estimates for Underground Injection

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	0%	0%	0%	100%	0%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	NA	NA	NA	NA	NA

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

NA - Not applicable. There were no underground injection amounts at the facilities surveyed for this SIC Code.

5.1.3.5 Releases and Other Waste Management Quantities to Land On Site

A comparison of the percent difference between facility estimates and site surveyor estimates for releases to land on site is presented in Table 5-22. Releases to land on-site occurred at only one site surveyed in SIC Codes 281 and 286, and at three sites surveyed in SIC Code 26. No sites surveyed in SIC Codes 25, 30, and 285 had releases to land on-site. In Figure 5-10, the

facility releases to land on-site are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

Table 5-22

Comparison of the Percent Difference (PD)¹ Between Facility and Site Surveyor Release Estimates to Land On Site

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	100%	100%	100%	100%	0%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	33%	33%	33%	33%	67%
286 (RY 1995)	0%	0%	0%	100%	0%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

NA - Not applicable. There were no releases to land on site at the facilities surveyed for this SIC Code.

5.1.3.6 Discharges to POTWs

A comparison of the percent difference between facility estimates and site surveyor estimates for discharges to POTWs is presented in Table 5-23. The number of facilities surveyed in SIC Codes 25, 26, 30, 281, 285, and 286 that reported discharges to a POTW are two, zero, four, one, one, and seven, respectively.

Figure 5-10. Comparison of Facility Estimates and Site Surveyor Estimates to Land On-Site

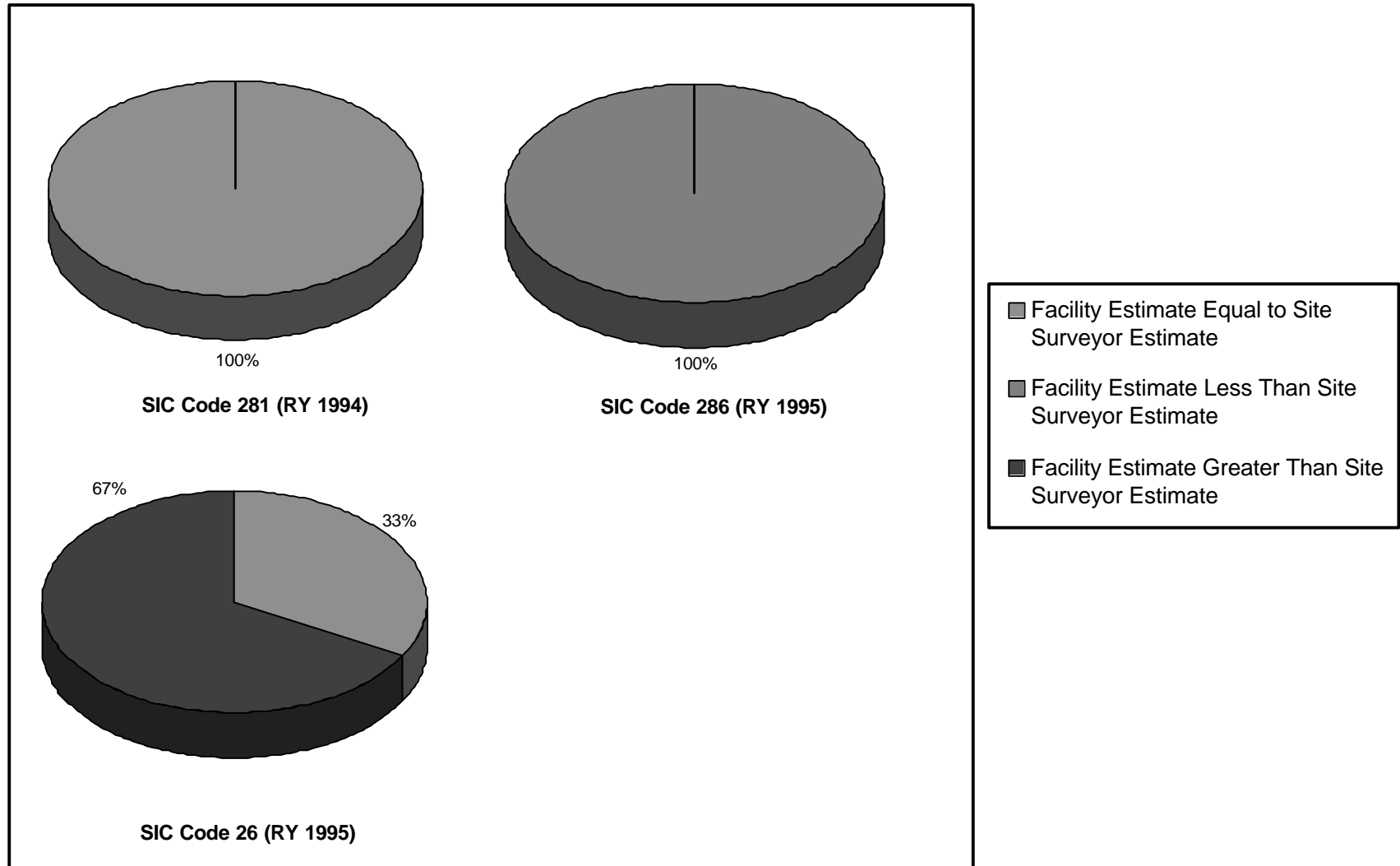


Table 5-23

**Comparison of the Percent Difference (PD)¹ Between Facility and Site
Surveyor Estimates for Discharges to POTWs**

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	0%	73%	73%	73%	27%
281 (RY 1994)	0%	0%	27%	65%	35%
285 (RY 1994)	0%	0%	0%	0%	100%
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	100%	100%	100%	100%	0%
286 (RY 1995)	17%	50%	67%	83%	17%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

NA - Not applicable. There were no discharges to POTWs at the facilities surveyed for this SIC Code.

In Figure 5-11, the facility discharge to POTW estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.7 Off-Site Transfers for Disposal

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for disposal is presented in Table 5-24. SIC Code 285, representing paint manufacturing facilities, had a high percentage of facilities which disagreed with the site surveyors estimates because most facilities overlooked container residue and other forms of off-site disposal.

**Figure 5-11. Comparison of Facility Estimates and Site Surveyor Estimates
for Discharges to POTWs**

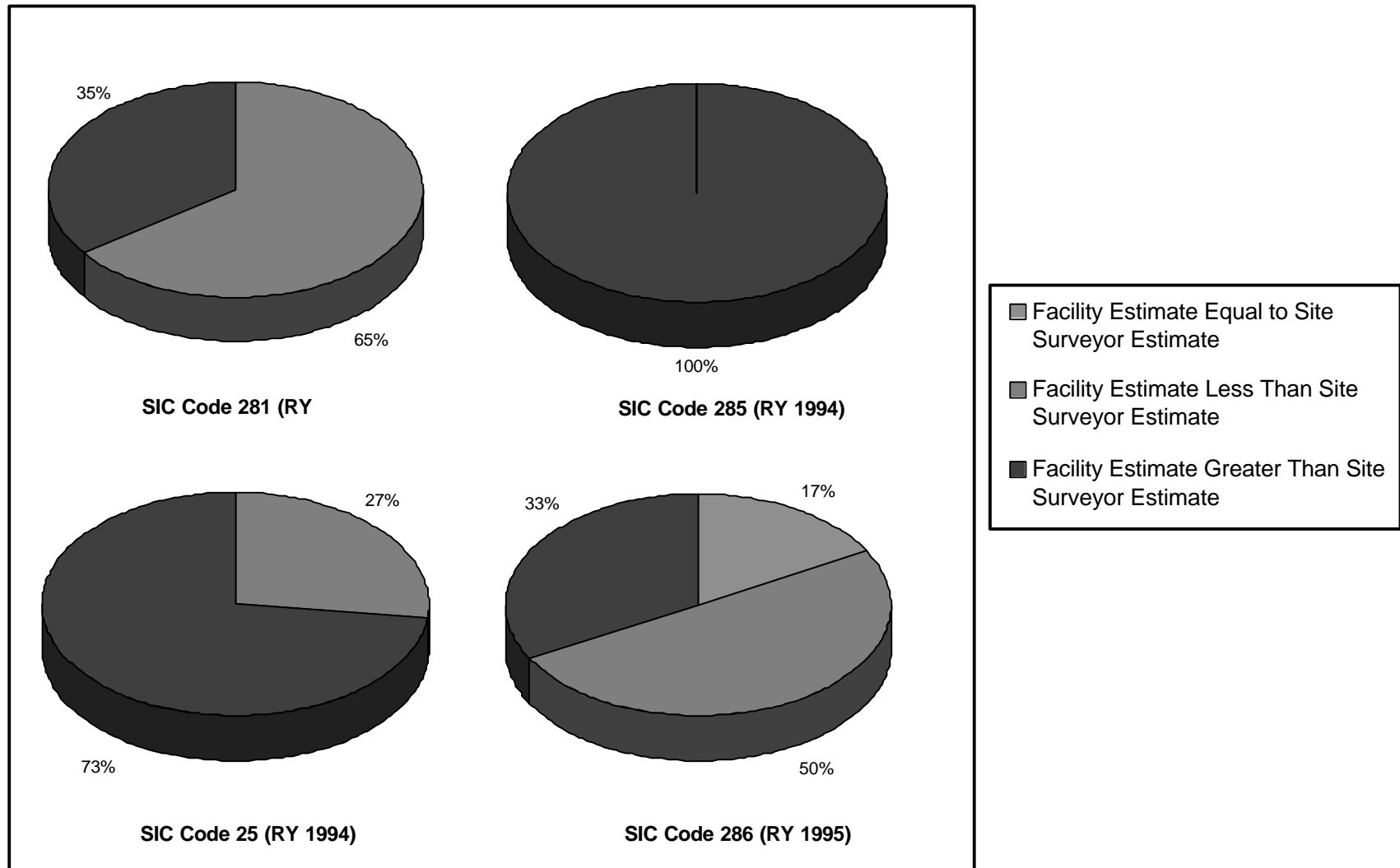


Table 5-24

Comparison of the Percent Difference (PD)¹ Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Disposal

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	15%	78%	78%	100%	0%
285 (RY 1994)	0%	0%	0%	4%	96%
30 (RY 1994)	0%	0%	0%	59%	41%
26 (RY 1995)	50%	100%	100%	100%	0%
286 (RY 1995)	50%	50%	100%	100%	0%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

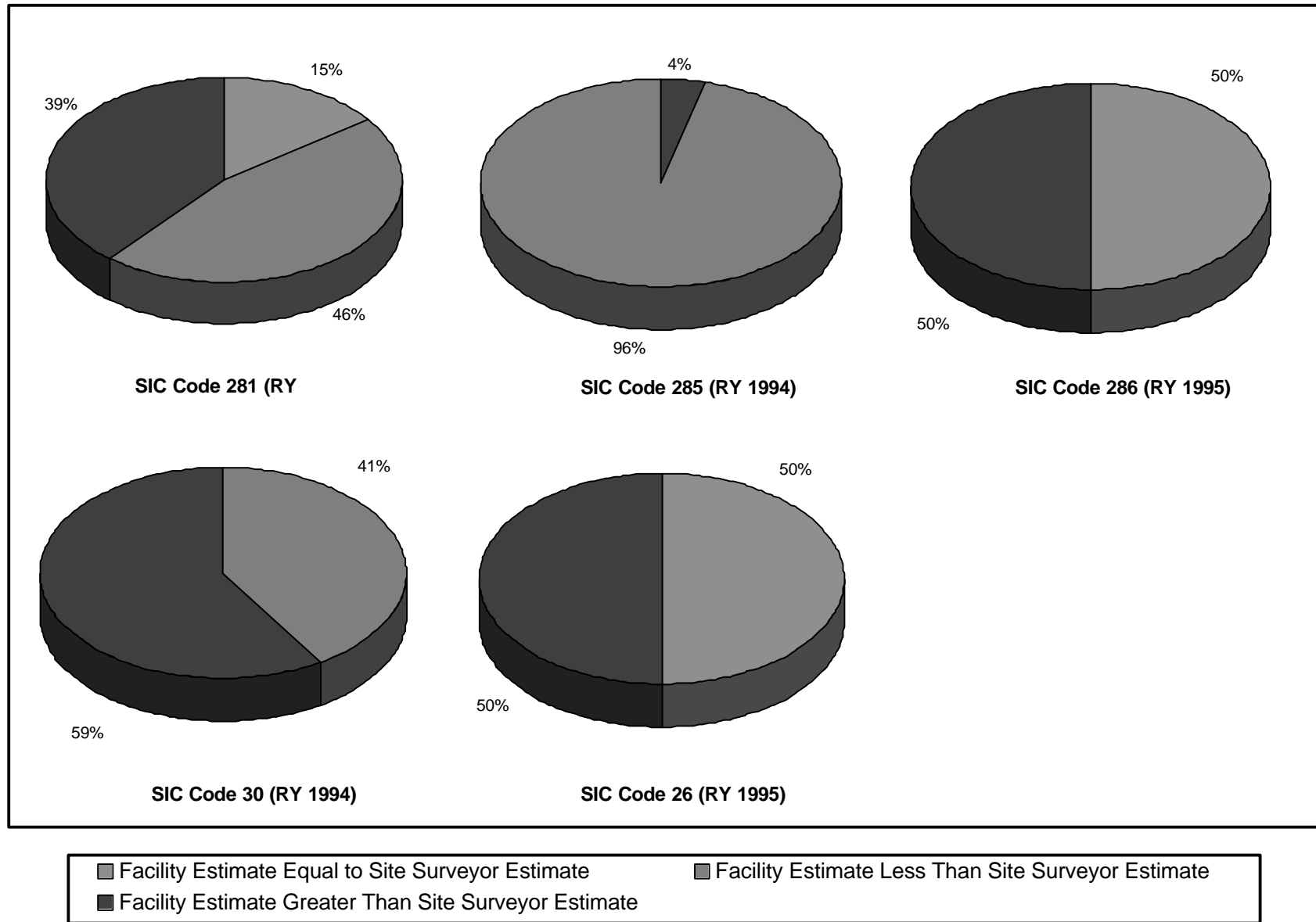
NA - Not applicable. There were no off-site transfers for disposal at the facilities surveyed for this SIC Code.

In Figure 5-12, the facility off-site transfers for disposal estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.8 Off-Site Transfers for Treatment

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for treatment is presented in Table 5-25. SIC Code 285, representing paint manufacturing facilities, had a total of two facilities with off-site transfers for treatment. These facilities overlooked many of these transfers. Container residue and bad process batches made up the bulk of off-site treatment transfers. As shown in Table 5-21, these two facility estimates were greater than 50% different than the site surveyor estimate. SIC Code 25, representing furniture manufacturing facilities, had three facilities which reported off-site transfers for treatment. These transfers were mainly disposed or recycled by off-site vendors

**Figure 5-12. Comparison of Facility Estimates and Site Surveyor Estimates
for Transfers Off-Site for Disposal**



instead of treated. Therefore, these facility estimates were greater than 50% different than the site surveyors estimates.

Table 5-25

Comparison of the Percent Difference (PD)¹ Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Treatment

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	0%	0%	0%	0%	100%
281 (RY 1994)	22%	38%	65%	65%	35%
285 (RY 1994)	0%	0%	0%	0%	100%
30 (RY 1994)	24%	27%	35%	73%	27%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	40%	80%	100%	100%	0%

¹PD = The absolute value of the percent difference, where percent difference = $(Fa - SS)/SS \times 100$, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-13, the facility off-site transfers for treatment estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.1.3.9 Off-Site Transfers for Recycling

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for recycling is presented in Table 5-26.

**Figure 5-13. Comparison of Facility Estimates and Site Surveyor Estimates
for Transfers Off-Site for Treatment**

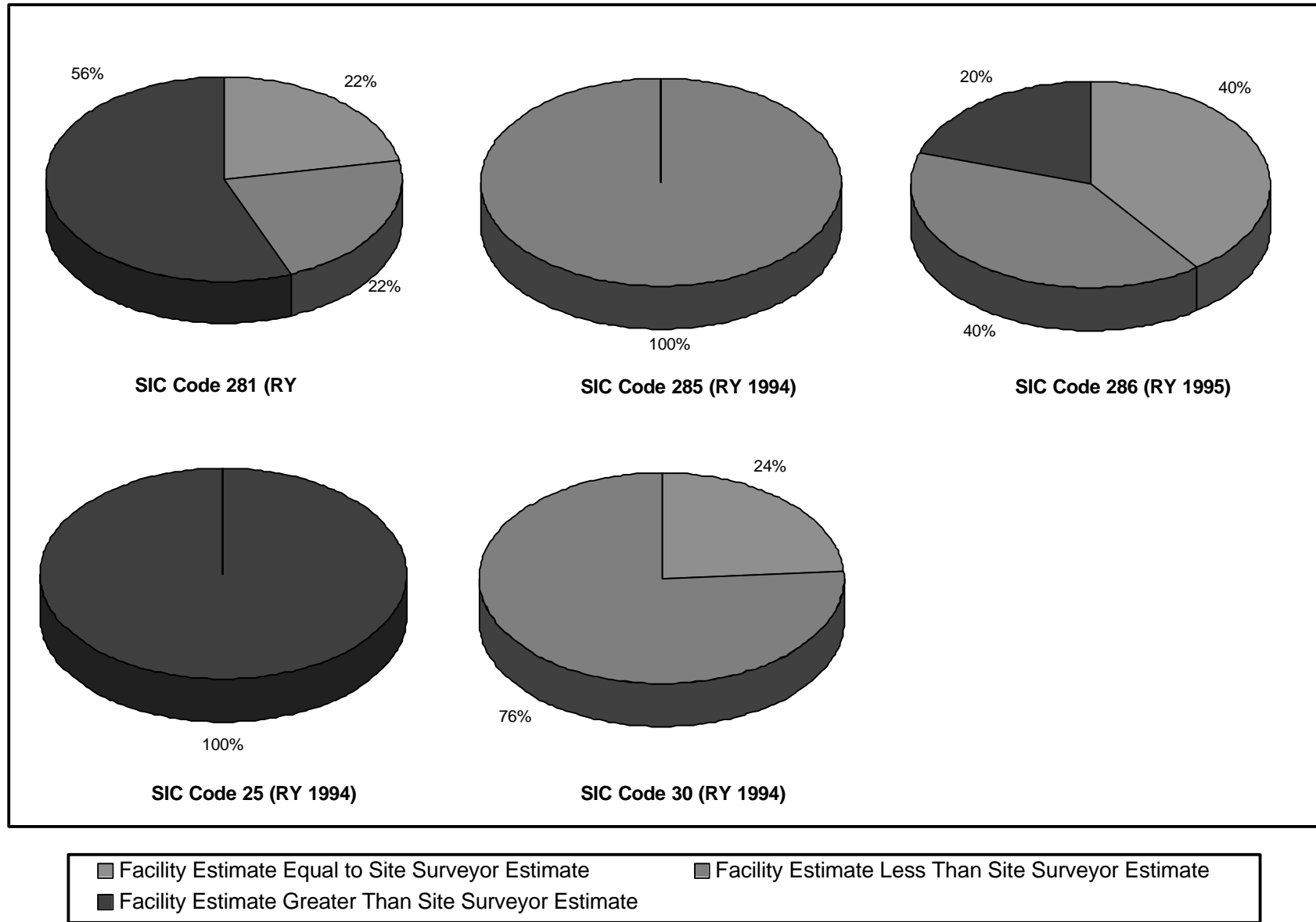


Table 5-26

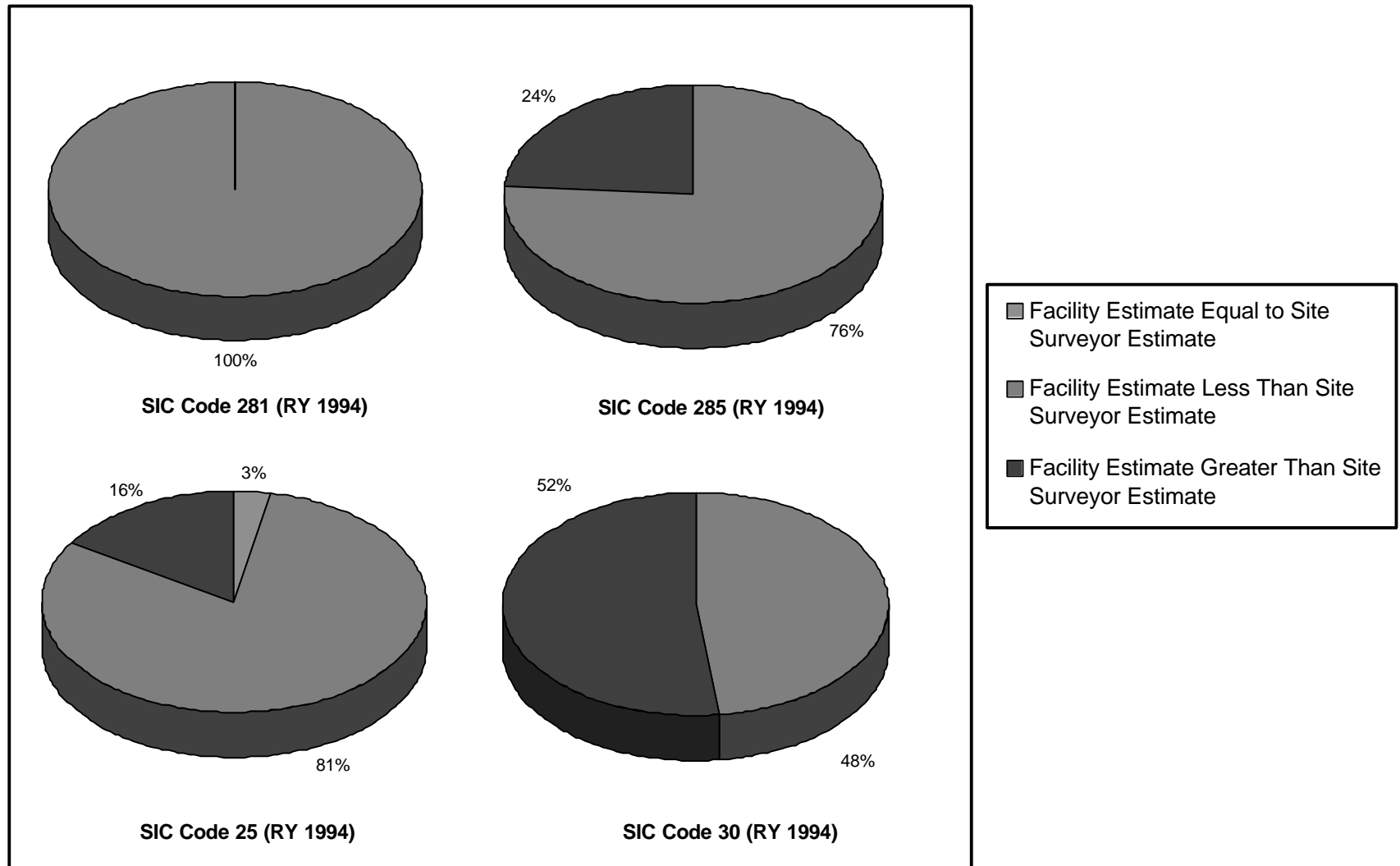
Comparison of the Percent Difference (PD)¹ Between Facility Transfer Estimates and Site Surveyor Transfer Estimates for Off-Site Recycling

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	3%	3%	50%	84%	16%
281 (RY 1994)	0%	0%	0%	100%	0%
285 (RY 1994)	0%	8%	24%	62%	38%
30 (RY 1994)	0%	0%	0%	100%	0%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	100%	100%	100%	100%	0%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-14, the facility off-site transfers for recycling estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates. There is a general tendency among SIC Codes 25, 281, and 285 for facility estimates to be less than site surveyor estimates. Facilities in these SIC Codes tend to overlook solvent remaining in container residue that can be recycled by some off-site vendors.

**Figure 5-14. Comparison of Facility Estimates and Site Surveyor Estimates
for Off-Site Recycling**



5.1.3.10 Off-Site Transfers for Energy Recovery

A comparison of the percent difference between facility estimates and site surveyor estimates for off-site transfers for energy recovery is presented in Table 5-27.

Table 5-27

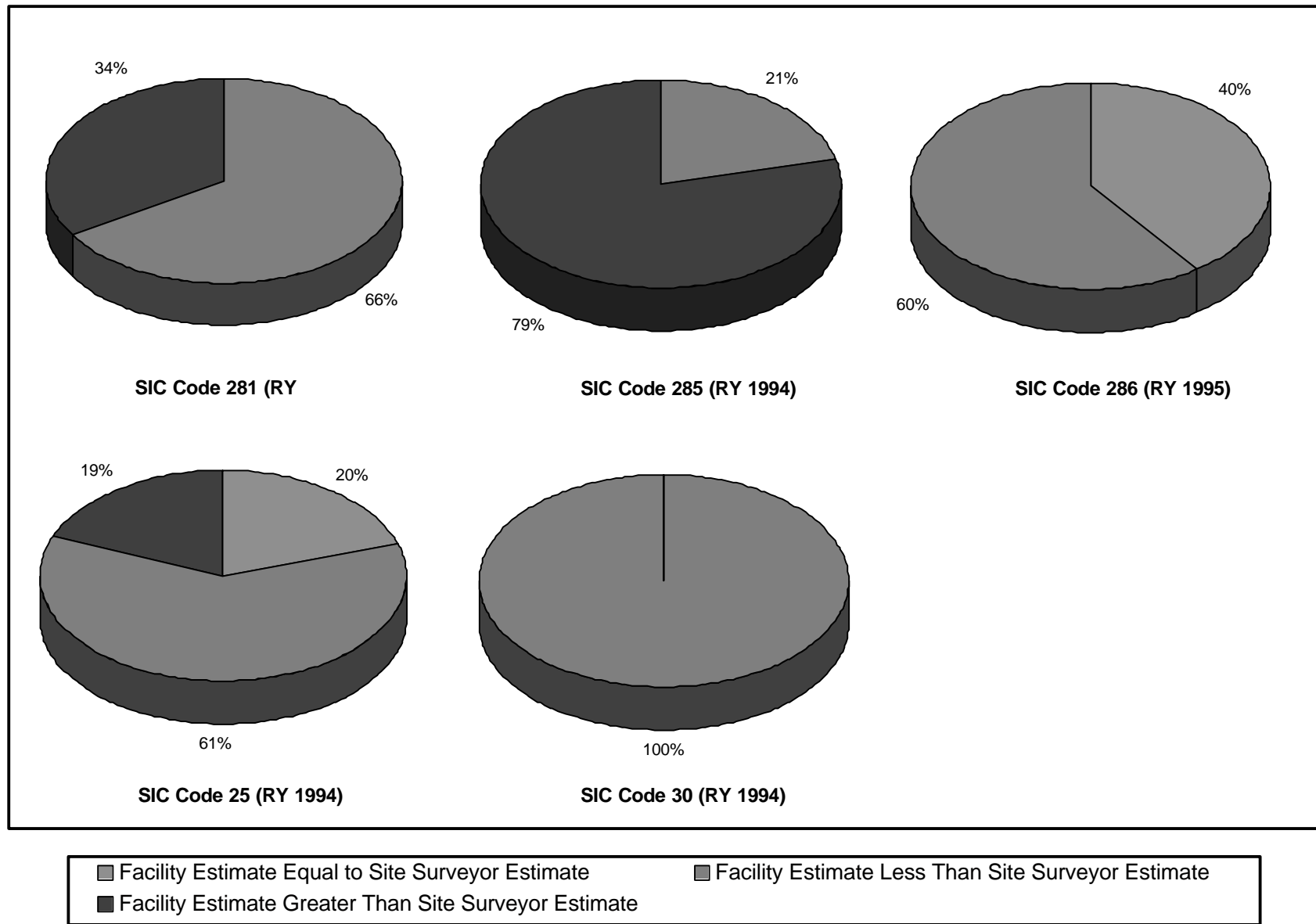
**Comparison of the Percent Difference (PD)¹ Between
Facility Transfer Estimates and Site Surveyor
Transfer Estimates for Off-Site Energy Recovery**

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	20%	39%	59%	77%	23%
281 (RY 1994)	0%	0%	0%	0%	100%
285 (RY 1994)	0%	0%	34%	100%	0%
30 (RY 1994)	0%	0%	100%	100%	0%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	40%	40%	80%	100%	0%

¹PD = The absolute value of the percent difference, where percent difference = $(Fa - SS)/SS \times 100$, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-15, the facility off-site transfers for energy recovery estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates. Over half the facilities in SIC Codes 25, 30, 281, and 286 had off-site transfer for energy recovery estimates less than the site surveyor estimates.

**Figure 5-15. Comparison of Facility Estimates and Site Surveyor Estimates
for Off-Site Energy Recovery**



5.2 On-Site Waste Management Activities

5.2.1 On-Site Waste Management Activities by SIC Code

On-site waste management activity quantities as reported by the facilities and the site surveyors were summed for all chemicals to get total facility on-site waste management activity quantities. Total facility on-site activity quantities were scaled and summed for all facilities to get total on-site activity quantities for each SIC Code. The total on-site activity quantities for SIC Codes are presented by activity in Tables 5-28 through 5-33. In general, facility and site surveyor estimates showed better agreement for on-site treatment than on-site recycling for each SIC Code.

Facilities in SIC Code 286 tend to be much larger than those in the other SIC Codes surveyed. The process operations performed in these facilities and the many uses for solvents in these processes create many opportunities for on-site recycling, treatment, and energy recovery, as shown by the large amount of chemicals in Table 5-33.

Table 5-28

**Summary of SIC Code 25 TRI On-Site Waste Management Activity Quantities
for RY 1994 (millions of lbs.)**

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	2.36	3.23	-27%
Treatment	5.54	5.26	5.3%
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-29

**Summary of SIC Code 281 TRI On-Site Waste Management Activity
Quantities for RY 1994 (millions of lbs.)**

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	332	328	1.2%
Treatment	79.7	78.9	1.0%
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-30

**Summary of SIC Code 285 TRI On-Site Waste Management Activity
Quantities for RY 1994 (millions of lbs.)**

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	3.48	2.95	18%
Treatment	0.00	0.00	NA
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-31

**Summary of SIC Code 30 TRI On-Site Waste Management Activity Quantities
for RY 1994 (millions of lbs.)**

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	160	160	-0.09%
Treatment	32.6	33.1	-1.36%
Energy Recovery	0.00	0.00	NA

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-32

**Summary of SIC Code 26 TRI On-Site Waste Management Activity Quantities
for Reporting Year 1995 (millions of lbs.)**

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	0	0	NA
Treatment	258	287	-10%
Energy Recovery	65.6	75.9	-14%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

Table 5-33

**Summary of SIC Code 286 TRI On-Site Waste Management Activity
Quantities for Reporting Year 1995 (millions of lbs.)**

On-Site Waste Management Activity	Quantity of Chemicals as Reported by the Facilities	Quantity of Chemicals as Reported by the Site Surveyors	Percent Difference*
Recycling	702	3,821	-82%
Treatment	144	223	-35%
Energy Recovery	222	222	0.0%

*Percent Difference = (Fa-SS)/SS x 100, where Fa = Facility Estimate and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

The large percent difference in on-site recycling activities in SIC Code 286 is due to one facility misreporting recycling activities. If this facility was excluded from the analysis, the percent difference would be less than 1%.

5.2.2 On-Site Recycling

A comparison of the percent difference between facility estimates and site surveyor estimates for on-site recycling is presented in Table 5-34. SIC Codes 281 and 30 had the best agreement between facility on-site recycling estimates and site surveyor on-site recycling estimates.

Table 5-34

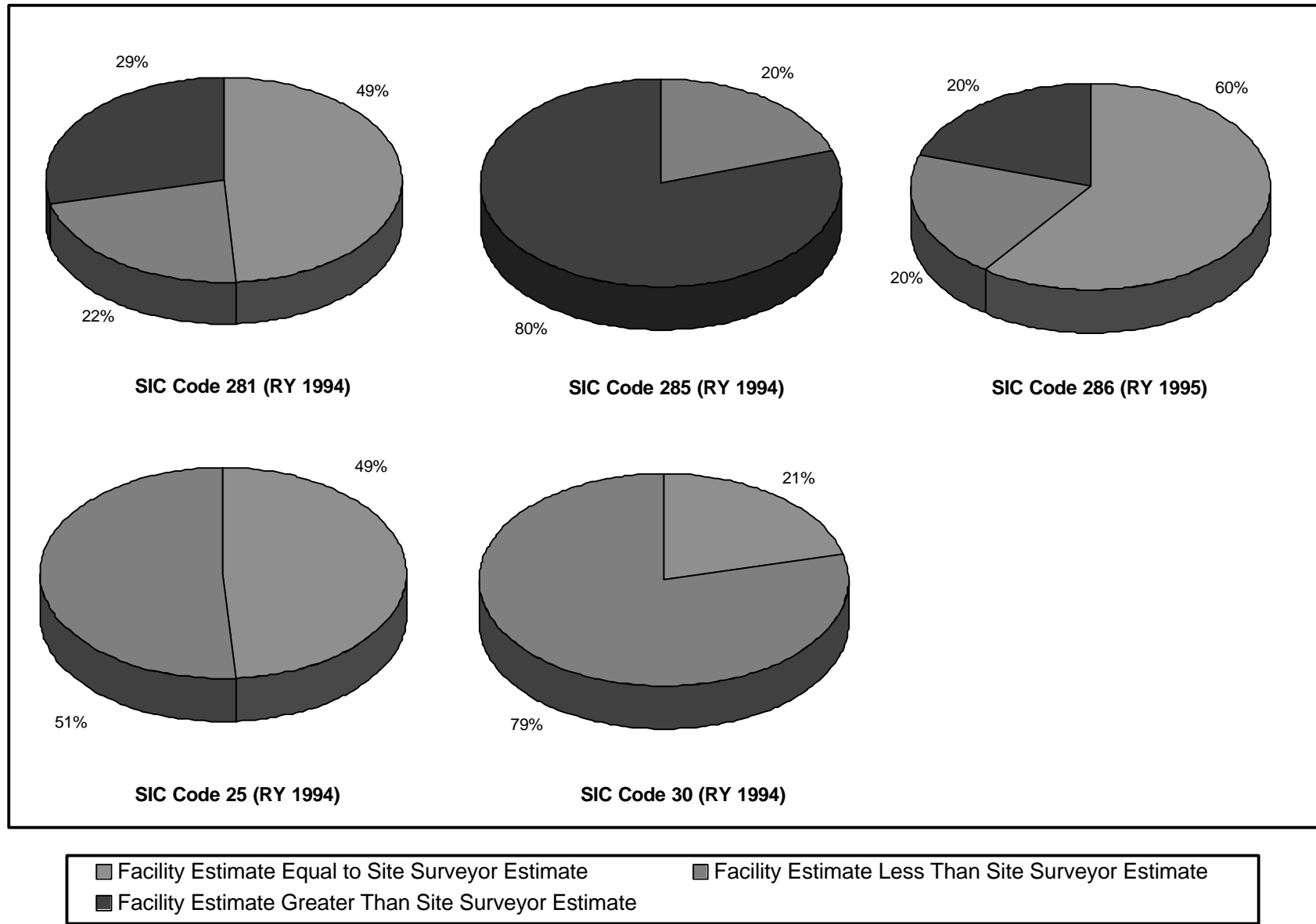
Comparison of the Percent Difference (PD)¹ Between Facility On-Site Recycling Estimates and Site Surveyor On-Site Recycling Estimates

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	49%	49%	49%	80%	20%
281 (RY 1994)	49%	49%	87%	100%	0%
285 (RY 1994)	0%	3%	3%	100%	0%
30 (RY 1994)	21%	100%	100%	100%	0%
26 (RY 1995)	NA	NA	NA	NA	NA
286 (RY 1995)	60%	80%	80%	80%	20%

¹PD = The absolute value of the percent difference, where percent difference = $(Fa - SS)/SS \times 100$, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-16, the facility on-site recycling estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

**Figure 5-16. Comparison of Facility Estimates and Site Surveyor Estimates
for On-Site Recycling**



5.2.3 On-Site Treatment

A comparison of the percent difference between facility estimates and site surveyor estimates for on-site treatment is presented in Table 5-35.

Table 5-35

Comparison of the Percent Difference (PD)¹ Between Facility On-Site Treatment Estimates and Site Surveyor On-Site Treatment Estimates

SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	0%	0%	100%	100%	0%
281 (RY 1994)	54%	63%	100%	100%	0%
285 (RY 1994)	100%	100%	100%	100%	0%
30 (RY 1994)	0%	0%	100%	100%	0%
26 (RY 1995)	13%	25%	38%	63%	37%
286 (RY 1995)	20%	80%	80%	80%	20%

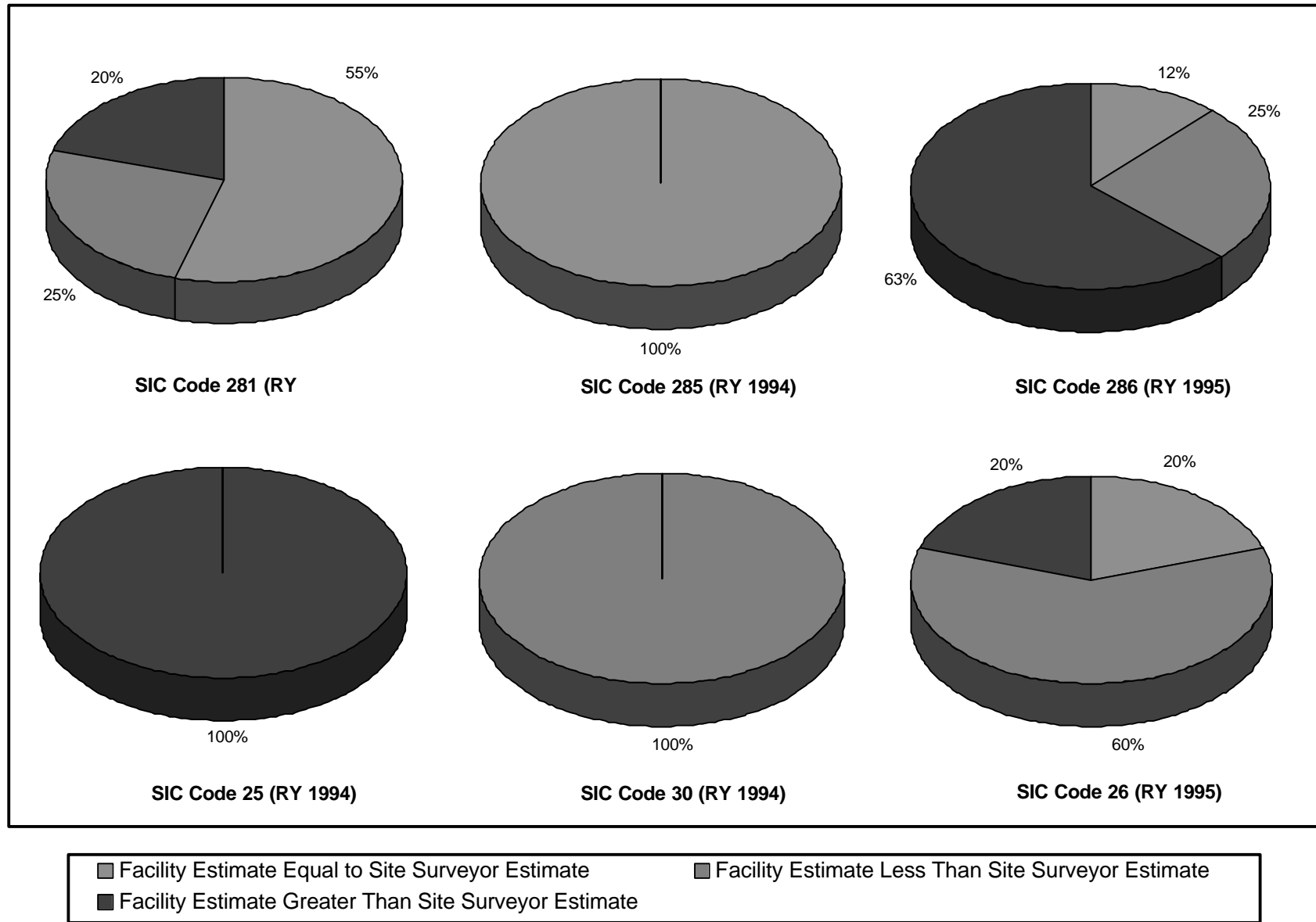
¹PD = The absolute value of the percent difference, where percent difference = $(Fa - SS)/SS \times 100$, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

In Figure 5-17, the facility on-site treatment estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

5.2.4 On-Site Energy Recovery

A comparison of the percent difference between facility estimates and site surveyor estimates for on-site energy recovery is presented in Table 5-36. Only six facilities surveyed in SIC Code 281, 286, and 26 performed on-site energy recovery. All facility

**Figure 5-17. Comparison of Facility Estimates and Site Surveyor Estimates
for On-Site Treatment**



estimates were equal to the site surveyor estimates except for one facility in SIC Code 26. No facilities surveyed in SIC Codes 25, 285, or 30 performed on-site energy recovery.

Table 5-36

**Comparison of the Percent Difference (PD)¹ Between
Facility On-Site Energy Recovery Estimates and
Site Surveyor On-Site Energy Recovery Estimates**

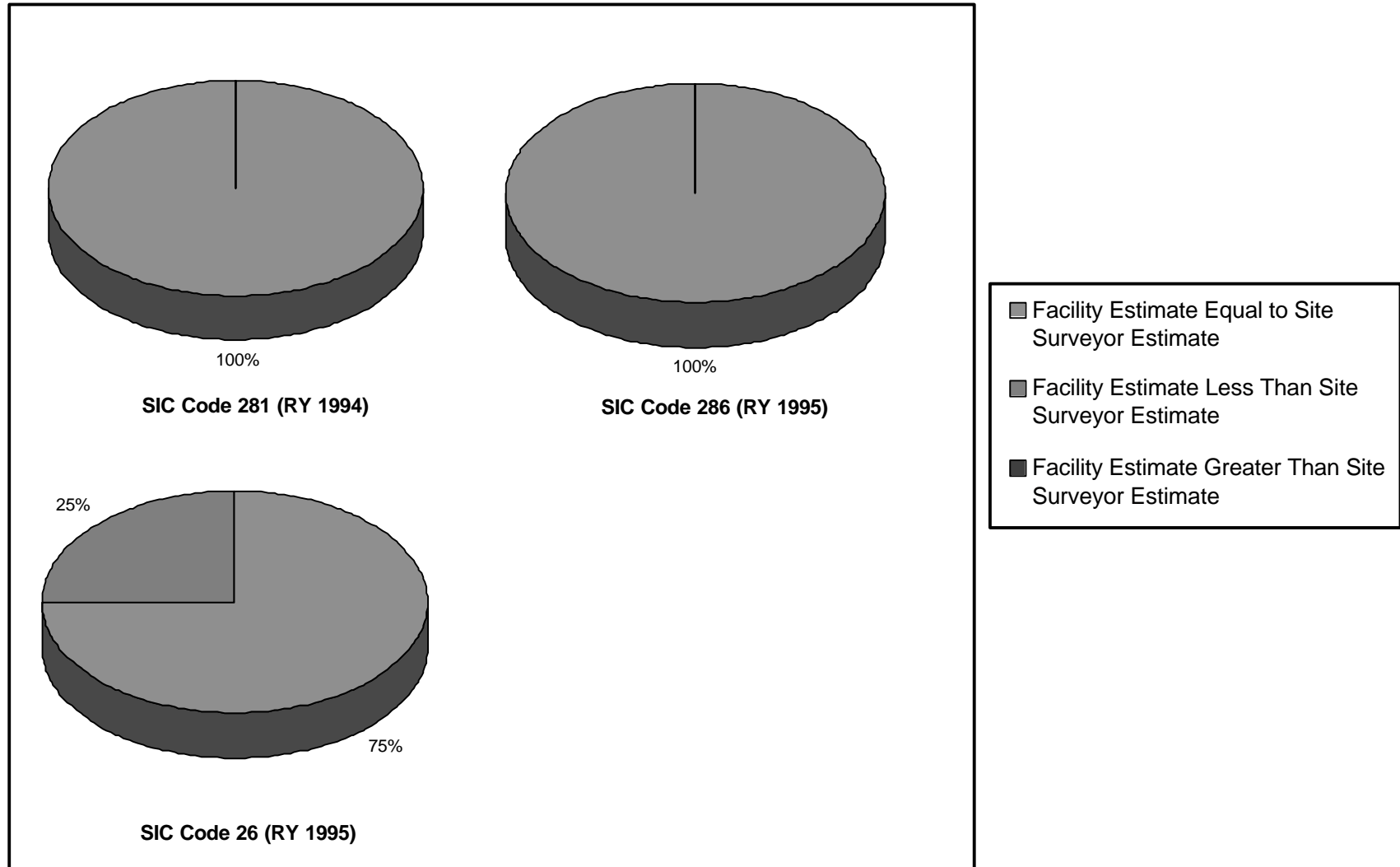
SIC Code	% Facilities Where PD=0	% Facilities Where PD<1%	% Facilities Where PD<10%	% Facilities Where PD<50%	% Facilities Where PD≥50%
25 (RY 1994)	NA	NA	NA	NA	NA
281 (RY 1994)	100%	100%	100%	100%	0%
285 (RY 1994)	NA	NA	NA	NA	NA
30 (RY 1994)	NA	NA	NA	NA	NA
26 (RY 1995)	75%	75%	75%	100%	0%
286 (RY 1995)	100%	100%	100%	100%	0%

¹PD = The absolute value of the percent difference, where percent difference = (Fa - SS)/SS x 100, Fa = Facility Estimate, and SS = Site Surveyor Estimate.

NA - Not applicable. There were no on-site activities of this kind at the facilities surveyed in this SIC Code.

In Figure 5-18, the facility on-site energy recovery estimates are again compared to the site surveyor estimates, but now the difference in facility and site surveyor estimates are classified according to whether the facility and the site surveyor estimates were equal, whether the facility estimates were less than the site surveyor estimates, or whether the facility estimates were greater than the site surveyor estimates.

**Figure 5-18. Comparison of Facility Estimates and Site Surveyor Estimates
for On-Site Energy Recovery**



5.3 Production Ratio/Activity Index

The production ratio/activity index is a pollutant specific measure that relates the changes in business activity between subsequent reporting years. The production ratio/activity index can be estimated using several methods. The methods are presented below:

- TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year;
- TCPV - the ratio of production volume in the current reporting year to the previous reporting year;
- TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year;
- HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year;
- WT - an activity index or production ratio based on a weighted average of data from several processes; and
- OTH - any other estimation method.

Figure 5-19 and Table 5-37 present the distribution of use for each method that was reported by the facilities, by SIC Code. Site surveyors reviewed the method used by each facility to determine whether it was the most appropriate. Table 5-38 presents the frequency that site surveyor's agreed with the facility's choice of method. As shown on the table, facilities which used a method not listed (as noted by the "other" category), could have used a better method to determine the production ratio. Table 5-39 presents the distribution of the most appropriate method as observed by site surveyors.

As shown on Table 5-38, the site surveyor disagreed most often with the "other" basis of estimate. Most production ratios can be accurately accounted for using the amount of chemical manufactured or used from one year to the next, or the change in production volume. Facilities would have more accurate activity indices if one of these three bases was used for ratio estimation.

Table 5-37

**Method of Estimate Used by Facilities to Calculate
Production Ratio**

SIC Code	Percent of Facilities Using TCM	Percent of Facilities Using TCPV	Percent of Facilities Using TCU	Percent of Facilities Using HR	Percent of Facilities Using WT	Percent of Facilities Using OTH
25 (RY 1994)	0%	52.1%	4.8%	21.5%	0%	21.6%
281 (RY 1994)	5.4%	53.6%	31.7%	0.0%	0%	9.3%
285 (RY 1994)	2.9%	67.7%	14.0%	0%	0%	15.4%
30 (RY 1994)	0%	14.9%	52.3%	0%	5.7%	27.1%
26 (RY 1995)	4.8%	78.6%	9.5%	0%	4.7%	2.4%
286 (RY 1995)	19.6%	57.4%	11.5%	1.6%	6.6%	3.3%

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.

TCPV - the ratio of production volume in the current reporting year to the previous reporting year.

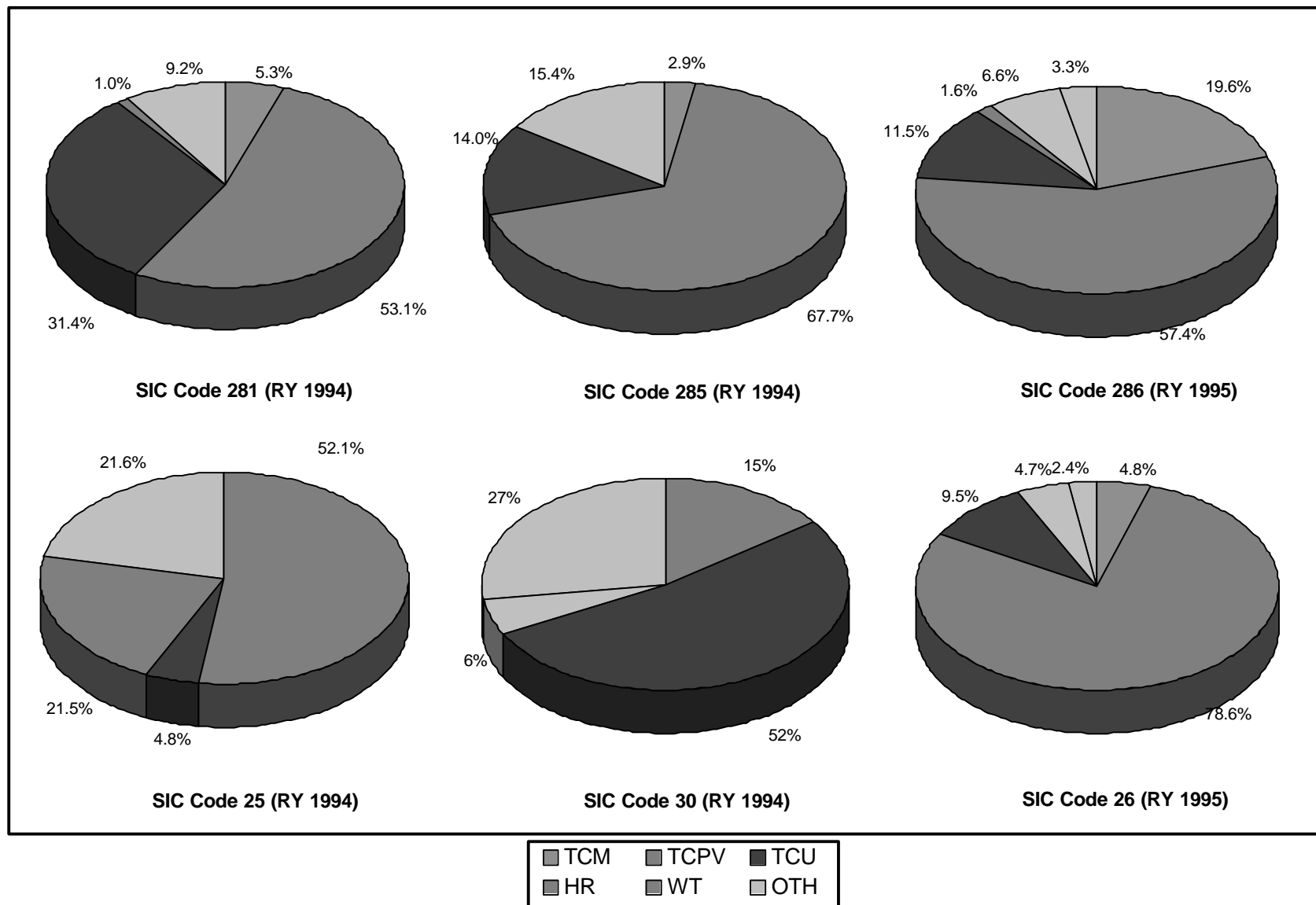
TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.

HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.

WT - an activity index or production ratio based on a weighted average of data from several processes.

OTH - any other estimation method.

Figure 5-19. Method of Estimate used by Facilities to Calculate PR/AI



The data for this Figure is shown in Table 5-37.

Table 5-38
**Percent of Time Surveyor Agreed with Facility Basis of
Production Ratio Estimate**

SIC Code	Facility Basis of Estimate	Percent of Time Surveyor Agreed with Basis
25 (RY 1994)	TCPV	61%
25 (RY 1994)	TCU	100%
25 (RY 1994)	HR	100%
25 (RY 1994)	OTH	51%
281 (RY 1994)	TCM	100%
281 (RY 1994)	TCPV	99%
281 (RY 1994)	TCU	100%
281 (RY 1994)	HR	100%
281 (RY 1994)	OTH	15%
285 (RY 1994)	TCM	100%
285 (RY 1994)	TCPV	100%
285 (RY 1994)	TCU	100%
285 (RY 1994)	OTH	0%
30 (RY 1994)	TCPV	89%
30 (RY 1994)	TCU	100%
30 (RY 1994)	WT	0%
30 (RY 1994)	OTH	48%
26 (RY 1995)	TCM	100%
26 (RY 1995)	TCPV	91%
26 (RY 1995)	TCU	100%
26 (RY 1995)	WT	100%
26 (RY 1995)	OTH	0%

Table 5-38 (Continued)

**Percent of Time Surveyor Agreed with Facility Basis of
Production Ratio Estimate**

SIC Code	Facility Basis of Estimate	Percent of Time Surveyor Agreed with Basis
286 (RY 1995)	TCM	100%
286 (RY 1995)	TCPV	100%
286 (RY 1995)	TCU	100%
286 (RY 1995)	HR	0%
286 (RY 1995)	WT	100%
286 (RY 1995)	OTH	50%

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.

TCPV - the ratio of production volume in the current reporting year to the previous reporting year.

TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.

HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.

WT - an activity index or production ratio based on a weighted average of data from several processes.

OTH - any other estimation method.

Table 5-39

**Method of Estimate That Should Have been Used by Facilities to
Calculate Production Ratio**

SIC Code	Percent of Facilities that Should Use TCM	Percent of Facilities that Should Use TCPV	Percent of Facilities that Should Use TCU	Percent of Facilities that Should Use HR	Percent of Facilities that Should Use WT	Percent of Facilities that Should Use OTH
25 (RY 1994)	0%	31.7%	31.0%	21.5%	4.8%	11.0%
281 (RY 1994)	5.8%	53.2%	39.5%	0.0%	0%	1.5%
285 (RY 1994)	2.9%	83.1%	14.0%	0%	0%	0%
30 (RY 1994)	0%	13.3%	73.6%	0%	0%	13.1%
26 (RY 1995)	7.0%	72.0%	16.3%	0%	0%	0%
286 (RY 1995)	19.4%	58.0%	14.5%	0%	0%	1.6%

TCM - the ratio of the amount of the chemical manufactured in the current reporting year to the previous reporting year.

TCPV - the ratio of production volume in the current reporting year to the previous reporting year.

TCU - an activity index of the amount of the toxic chemical used in the current reporting year to the previous reporting year.

HR - an activity index of the amount of operating hours for an activity in the current reporting year to the previous reporting year.

WT - an activity index or production ratio based on a weighted average of data from several processes.

OTH - any other estimation method.

5.4 Source Reduction Activities

The following discussion reviews how accurately facilities indicate source reduction activities on Form Rs. Starting in reporting year 1991, EPA required facilities to include on their Form R reports information describing source reduction activities that were implemented to reduce the quantity of Section 313 chemicals in waste. This information offers users of the data insight into how often industrial facilities reduce pollution at the sources. To assess the accuracy of source reduction entries in the TRI database, analyses in this section address three questions:

- Are the source reduction activities that facilities indicate on Form Rs legitimate?
- Why do facilities make errors when claiming source reduction?
- Do facilities consistently report source reduction activities on Form Rs?

It should be noted that this section focuses only on source reduction activities that facilities indicate on “Form Rs.” Form As do not include fields for reporting source reduction.

5.4.1 Errors in Classifying Source Reduction

To identify errors commonly made by facilities and reasons why facilities made these errors, site surveyors determined during each visit whether facilities indicate source reduction activities that were consistent with definitions of source reduction presented in the EPCRA Section 313 reporting instructions. In cases where facilities did not claim source reduction activities, site surveyors generally did not determine whether facilities overlooked source reduction activities. Accordingly, the most recent site survey data are sufficient for evaluating whether source reduction activities currently loaded in the TRI database are legitimate, but the data are not sufficient for determining the total number of source reduction activities that should have been reported.

Table 5-40 summarizes how often source reduction activities were used on EPCRA Section 313 chemicals and how often these claims were made in error. For reference,

Table 5-41 indicates the source reduction activities most commonly used on EPCRA Section 313 chemicals in the selected SIC Codes. The data in these tables suggest that facilities in the furniture manufacturing industry (SIC Code 25), organic chemicals industry (SIC Code 286) and plastics manufacturing industry (SIC Code 30) claim source reduction much more frequently than facilities in the inorganic chemical manufacturing industry (SIC Code 281), paper industry (SIC Code 26), and paint manufacturing industry (SIC Code 285). Modifications to spray application and surface coating processes account for a majority of the source reduction activities claimed by furniture manufacturers. Employee training and improved maintenance account for a majority of the source reduction activities claimed by organic chemical manufacturers. No specific group of source reduction activities were as prevalent for the other industries.

The data also indicate that, of the source reduction activities claimed by rubber and plastic manufacturing facilities, nearly three fourths were claimed in error. Many rubber and plastic manufacturing facilities claimed that a reduction in the number of toxic chemical supplies was source reduction even though the reduction in suppliers did not decrease the amount of toxic chemicals purchased or used. The frequency of errors was notably lower for furniture manufacturers and inorganic chemical manufacturers, and no errors were identified in the source reduction activities claimed by paint manufacturers, organic chemical manufacturers, and paperboard facilities.

5.4.2 Sources of Errors Made When Claiming Source Reduction

Specific reasons for erroneously classifying source reduction activities differ from one facility to the next. In general, however, most errors resulted from facilities not understanding exactly what activities constitute source reduction. Site surveyors noted several examples supporting this hypothesis:

Table 5-40

Errors in Source Reduction Activity Classifications

Reporting Year	SIC Code	Frequency with which facilities claim source reduction activities		Frequency with which facilities make errors when claiming source reduction	
		Total number of source reduction activities claimed by the selected facilities	Estimated percent of Form Rs submitted by facilities in SIC Code with source reduction claimed ^a	Number of source reduction activities claimed in error by the selected facilities	Estimated percent of source reduction activities that are claimed, but in error ^a
1994	25	48	33 %	8	27 %
	281	24	14 %	6	22 %
	285	30	21 %	0	0 %
	30	21	32 %	14	78 %
1995	26	3	5.9%	0	0%
	286	36	30.1%	0	0%

^a Percents in this column were calculated using the weighting factors discussed in Section 2.6.3.

Table 5-41

**Most Common Source Reduction Activities
Claimed by the Selected Facilities**

SIC Code	Source Reduction Code	Description	Percent of Chemicals at Selected Facilities that used this Code
25	W72	Modified spray systems for coating applications	16.9%
	W73	Substituted materials used for coating applications	10.0%
	W74	Improved application techniques for surface coating	9.5%
	W39	Miscellaneous spill and leak prevention	9.0%
	7 others	Many different descriptions	8.5%
	W21	Ensuring materials are used before reaching their shelf-life	0.5%
281	6 others	Many different descriptions	6.2%
	W25	Instituted programs to exchange unwanted materials	4.0%
	W39	Miscellaneous spill and leak prevention	4.0%
	W82	Modified composition of products	4.0%
	W52	Modified equipment, layout, or piping	3.0%
285	3 others	Many different descriptions	13.3%
	W42	Substituted raw materials	10.9%
	W13	Improved maintenance scheduling and recordkeeping	7.1%
	W39	Miscellaneous spill and leak prevention	7.1%
	W14	Changed production schedule to minimize changeovers	5.5%
	W52	Modified process equipment, layout, or piping	5.5%
30	5 others	Many different descriptions	12.6%
	W32	Improved practices for loading and unloading chemicals	0.7%
26	W58	Process modifications	5.9%
286	W13	Employee training and improved maintenance	23.3%
	5 others	Many different descriptions	9.6%
	W36	Spill and leak detection program	5.5%
	W51	Recirculation within processes	5.5%
	W19	Reuse of materials	5.5%

- An organic chemical manufacturing facility installed a new pollution control mechanism to remove ammonia from a waste stream. The facility considered the new device as source reduction, but the site surveyor noted that the facility already accounted for the new device as “treatment” and should not have claimed the device as source reduction.
- Due to decreased demand for a particular product, a paint manufacturing facility purchased less of a glycol ether solvent. The facility claimed this reduced usage of raw materials as source reduction, but the site surveyor did not consider decline in production demand as source reduction.
- A furniture manufacturing facility claimed source reduction after installing a new software system to track purchases of Section 313 chemicals. Although this system helped the facility make more accurate threshold determinations, the site surveyor noted that the software did not reduce amounts of hazardous chemicals that were purchased. Therefore, the site surveyor concluded that installing the new software was not source reduction.

Because errors in claiming source reduction resulted primarily from facilities misinterpreting definitions, EPA can help minimize similar errors in future reporting years by preparing revised reporting instructions that clarify which activities should, and should not, be classified as source reduction.

5.4.3 Feedback from Facilities

The accuracy of source reduction data depends to a great extent on how facilities choose to implement the reporting requirements. Although the survey instrument did not include explicit fields for documenting feedback from facilities regarding source reduction, site surveyors noted several relevant comments made by facility contacts:

- Some facilities noted that source reduction codes do not inform those who access TRI data of the extent to which emissions are reduced by source reduction. These facilities, therefore, saw little benefit from claiming source reduction activities on their Form Rs.
- Some facilities found the list of source reduction codes cumbersome, noting that the list contains too many codes or that definitions of specific codes are too vague.

- Some facilities chose to not claim on their Form Rs legitimate source reduction activities because the activities caused only marginal reductions in overall releases.
- Facilities seem confused about whether source reduction activities should be reported only for the first year in which they were implemented or for every year thereafter. This confusion leads to inconsistent reporting practices among the facilities that claim source reduction. This confusion stems from discrepancies in Agency guidance. The agency guidance document states that source reduction activities should be reported only in the first year of implementation while the Pollution Prevention Act states that each annual report will identify the source reduction practices used with respect to each chemical for which the report is submitted.

These comments from facilities stress that, for a variety of reasons, facilities often choose to not report legitimate source reduction activities. Therefore, the total number of source reduction activities currently logged in the TRI database may understate the extent of pollution prevention efforts adopted by industrial facilities.

5.4.4 Overall Accuracy of Source Reduction Data

Site surveyors found that facilities in the selected industries frequently misinterpreted definitions of source reduction and should not have claimed roughly 30 percent of all source reduction activities reported to TRI in 1994 and 1995. Observations made by site surveyors and feedback provided by facilities both suggest that many facilities did not claim legitimate source reduction activities on their Form Rs, but the current site survey data are insufficient for evaluating how often this occurs. Accordingly, the quality of source reduction data in the TRI database is compromised by omissions and erroneous submissions of source reduction information, and TRI data, therefore, may not be an accurate measure of the extent of pollution prevention efforts for many industries.

Because the primary cause of errors in reporting source reduction seems to be due to facilities misinterpreting definitions, EPA can help improve the accuracy of source reduction data by preparing TRI reporting instructions that clearly define which activities are, and are not, considered to be source reduction.